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**STS CONSULTANTS**

**C O N S U L T I N G   E N G I N E E R S**

Radiation Survey  
26-Acre Site  
Southwest Corner of Wacker Drive  
and Lake Shore Drive  
Chicago, Illinois

1-32193-XH  
September 19, 2001



STS Consultants, Ltd.  
Solutions through Science & Engineering

September 19, 2001

Mr. James Loewenberg  
Loewenberg and Associates  
1 West Superior Street  
Chicago, Illinois 60610

Illinois Center Plaza Venture  
An Illinois Limited Partnership  
c/o Melvin Lippe  
Altheimer & Gray  
10 South Wacker Drive  
Chicago, Illinois 60606-7482

RE: Radiation Survey, 26-Acre Site, Southwest Corner Wacker Drive and Lake Shore Drive, 221 North Columbus Drive, Chicago, Illinois - STS Project No. 1-321693-XH

Dear Mr. Loewenberg and Mr. Lippe:

Enclosed please find the final report for the above-referenced investigation. The findings of this report were communicated in a conference call Monday, August 20, 2001. A draft of the text was provided Wednesday, September 5, 2001.

We appreciate being of service on this very interesting project. Please contact us with any questions you may have regarding this report.

Regards,

STS CONSULTANTS, LTD.

Stephen G. Torres, C.P.G.  
Science Group Manager

Richard G. Berggreen, C.P.G.  
Principal Geologist

Attachment

**RADIATION SURVEY  
26-ACRE SITE, SOUTHWEST CORNER  
OF WACKER DRIVE AND LAKE SHORE DRIVE  
CHICAGO, ILLINOIS**

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**RADIATION SURVEY  
26-ACRE SITE, SOUTHWEST CORNER  
OF WACKER DRIVE AND LAKE SHORE DRIVE  
CHICAGO, ILLINOIS**

**1.0      INTRODUCTION**

STS Consultants, Ltd. (STS) conducted an investigation for radiologically-impacted soil on the subject site during July and August 2001. The subject site consists of approximately 26 acres located at the southwest corner of Wacker Drive and Lake Shore Drive at 221 North Columbus Drive, Chicago, Illinois (Figure 1). The site is currently developed as Family Golf Centers at Chicago Metro, a golf course and driving range, with associated support buildings, facilities and parking lots.

Several properties north of the Chicago River in the Streeterville neighborhood have been found to exhibit evidence of radiological impacts (herein referred to as "contamination") from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company during the 1910s, 20s and 30s. The contamination consists of elevated concentrations of thorium, uranium and their radioactive decay products. Several of those properties required removal of the impacted soils. The U.S. Environmental Protection Agency (USEPA) requested access and conducted a reconnaissance survey of a portion of the subject site. That survey identified two locations where the gamma radiation levels were anomalously high. Field analysis by USEPA using a portable multi-channel analyzer in areas exhibiting elevated gamma radiation identified uranium and thorium radionuclides consistent with the other Streeterville properties (USEPA correspondence, July 2, 2001). STS was contracted to investigate the entire 26-acre site to evaluate whether additional locations exhibiting contamination might be present, and to attempt to validate the USEPA survey results.

This investigation did not seek to determine whether the impacted soil would require removal or could remain in place. If concurrence can be obtained from USEPA and other

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appropriate regulatory agencies that no significant risk to public health or the environment results from leaving the material in place, it may not require removal.

## 2.0 OBJECTIVES

The objectives of the radiological site investigation reported herein are two fold. First, an evaluation of the locations and apparent volume of impacted soil was to be made. The site was to be surveyed to identify locations that show evidence of anomalously high gamma radiation in a surface survey. Those locations were to be surveyed through downhole gamma logging methods to assess the vertical extent of the identified contamination and develop an estimate of the volume of contaminated soil. Second, a cost estimate was to be developed for possible remedial measures. For this report, the only remedial measure considered was excavation of soil and disposal at a licensed low-level radioactive materials disposal site. Other options for leaving material on-site would require USEPA concurrence. Certain assumptions were made in both the volume estimate and in the cost estimate. Those assumptions, and to the extent possible, the related cost implications for those assumptions are included in this report.

### 3.0 SCOPE OF WORK

The investigation of the 26-acre subject site consisted of three principal tasks.

- A surface survey of the entire site was conducted on a 5-meter grid.
- Borings were advanced on and in the vicinity of anomalous radiation readings.
- Soil samples were collected and submitted for laboratory analyses.

The following sections describe these tasks in detail.

#### Task 1 - Surface Gamma Survey

A gamma radiation survey of the site was conducted on a 5-meter grid (5 X 5 meter cell size). The grid was established by measuring along the site margins and establishing two lines crossing the site from north to south and east to west. Cells were designated using an alphabetic designation in the north-south direction and numeric designations in the east-west direction. The grid stations along the site margins and the lines crossing the site were marked with survey flagging tape on the perimeter fence and survey wire pin flags within the center of the site. The grid intersections were painted on the ground.

The survey was conducted using a Ludlum 2221 rater-scaler and a 2 X 2 NaI gamma probe. The probe was unshielded to provide for maximum sensitivity in the survey mode. The probe was carried immediately above the ground surface. Each cell was walked at approximately 1 meter per second or slower while sweeping the probe over the ground surface to measure the gamma radiation within each cell. The maximum gamma reading in counts per minute (CPM) for each cell was recorded.

Cells occupied by standing water were not surveyed since standing water can serve as a barrier to gamma radiation in the subsurface (The lake on-site occupied 116 cells; other standing water covered 10 cells. The entire survey consisted of more than 3,800 cells).

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Cells crossed by fences along the site margins were surveyed only within the site property line. Cells crossed by fences within the site were surveyed on both sides of the fence and the higher reading was recorded.

Three separate survey crews collected the surface gamma data. The instruments used by the three teams were calibrated against the same set of standards and minor variations are present in their readings. However, the values for the three instruments are sufficiently close to each other so as to not significantly influence the identification of anomalous gamma radiation locations.

An attempt was made to collect the location data using Global Positioning System (GPS) data. However, the close proximity to numerous tall buildings prevented obtaining the GPS unit from making contact with the required number of system satellites. As a result, all data were collected and recorded manually. A total of approximately 3,870 cells were surveyed for gamma radiation. The maximum value measured in each cell is shown on the spreadsheet covering the site, presented in Appendix A.

The surface gamma survey identified two general areas that exhibited elevated gamma readings. The two general areas were comprised of several smaller subareas or discrete spots. The general areas and the component sub-areas and spots are shown on Figure 2.

Elevated gamma readings are defined as readings that exceed the general background values by a factor of two or more. The readings were also compared to the gamma measurements indicative of an exceedance of the cleanup level established by the USEPA for the Streeterville sites. That cleanup level is 7.1 picocuries per gram (pCi/g) total radium (Ra-226 plus Ra-228) and is indicated by gamma counts for the instruments used (unshielded) of approximately 20,000 CPM.

Task 2 - Soil Borings and Down-hole Gamma Logging

The locations identified as exhibiting elevated gamma radiation were subsequently explored through soil borings and down-hole gamma logging. This subsurface exploration provided for assessing the vertical extent of the anomaly noted in the surface survey. Additionally, the borings provided soil samples that could be submitted for laboratory analyses (Task 3).

Borings were drilled with a truck-mounted drill rig at the locations of the anomalous gamma readings. The borings were restricted to a maximum of depth 12 feet due to permit requirements within the city of Chicago for borings deeper than 12 feet. The borings were continuously sampled using solid flight augers. Borehole size was 4-inch diameter. Upon completion of the boring and sampling, a 3-inch diameter PVC casing with an end cap was inserted into the boring to minimize potential for collapse or cave-in of the boring and to protect the down-hole survey equipment from ground water encountered in some of the boreholes.

In addition to the borings drilled on the locations where anomalous gamma readings were measured, step-out borings were drilled around the initial boring locations. These step-out borings were drilled to assess the apparent horizontal extent of the anomaly in the subsurface, if present. Step-out borings were drilled around the anomalies showing the highest values, the largest areal extent and at locations where access was not restricted by subsurface interference such as utilities.

Locations of the boreholes had to be cleared by the golf facility operators, due to the presence of the irrigation system and other subsurface utilities. Additionally, access to some locations was restricted to prevent damage to the tees and greens by the truck-mounted drill rig. At those locations, attempts were made to advance borings by hand.

However, the presence of rubble fill in the subsurface precluded the use of the hand sampling technique.

A total of 35 borings were drilled, 16 in the southern area on the driving range portion of the site, and 19 in the northern area on the golf course portion of the site. Figures 3A and 3B show the boring locations.

Down-hole gamma logging was conducted in all borings using a Ludlum 2221 rater-scaler and 2 X 2 NaI probe. Gamma measurements were taken in 6-inch increments for the full depth of the boring. Measurements were taken in counts per 30 seconds and were compared to the threshold for the cleanup level established by USEPA for other contaminated sites in the area.

The downhole gamma logging is relatively sensitive to radioactive material in the vicinity of the borings, in that the detector may be surrounded by the material and as a result may detect gamma radiation from a large volume of material. Additionally, the detector may receive radiation from material above or below the interval being measured. This influence from material above or below the interval being measured is referred to as "shine". Where "shine" occurs, readings may appear to exceed the cleanup threshold while the actual soil at that depth does not exceed the threshold. The possibility for "shine" was considered in the calculated volume estimates and is discussed in the assumptions.

The downhole survey is limited to evaluating the soil in the immediate vicinity of the borehole. Soil provides an effective shield for gamma radiation, and gamma radiation is effectively blocked by soil more than about 2 feet thick. Therefore, it must be recognized that the survey instruments, in either the surface survey or the downhole survey, generally will not see evidence of thorium-impacted soil buried more than 2 feet deep nor more than 2 feet radius distance from the borehole.

The downhole gamma surveys found evidence of elevated gamma readings in 13 of the 35 boreholes surveyed. The thickness of the impacted zone, not accounting for "shine", ranged from less than 1 foot to greater than 10 feet. Many of the borings, 10 of 13, showed elevated gamma readings in the upper 2 feet. Appendix B presents the downhole gamma survey results.

### Task 3 - Gamma Spectroscopic Analysis of Soil Samples

Soil samples were collected continuously from the borings drilled in Task 2. The samples to be submitted for laboratory analyses were selected on the basis of the downhole gamma survey results. Two samples were generally selected from each boring to assess the vertical extent of the impacted interval.

The samples were placed in 500-milliliter Marinelli beakers, specifically designed for high resolution gamma spectroscopy analysis. The material submitted for analysis was from the suspect interval; however, the sample may not contain the radioactive material, if the gamma radiation detected in the downhole survey was from immediately adjacent to the borehole, but not within the sampled material. As a result, where the downhole survey shows evidence of elevated gamma radiation but the laboratory results do not, it is likely there is radioactive material present in the subsurface that was not intercepted and sampled in the boring.

A total of 50 soil samples were recovered and submitted for analysis. Additionally, one surface sample from the upper 1 foot of soil at one location was collected where a borehole could not be drilled. Of those 51 samples, 7 showed radionuclide concentrations that exceeded the USEPA established cleanup levels. The detections correlated to the boreholes where elevated downhole gamma measurements were noted, and the highest gamma readings correlated to the highest analytical results. Laboratory and test results are presented in Appendix C.

The radionuclides of principal interest are those indicative of the radium concentrations, as these are the concentrations used for comparison to the USEPA-specified cleanup criteria. The USEPA criteria is 7.1 pCi/g of total radium, radium-226 plus radium-228. Lead-214 (Pb-214) is the surrogate used to quantify radium-226 (Ra-226), in the uranium decay chain. Actinium-228 (Ac-228) is the surrogate used to quantify radium-228 (Ra-228), in the thorium decay chain. The Streeterville materials typically have a thorium to uranium ratio of around 4 to 1. Most of the samples that showed levels above the cleanup criteria had thorium:uranium ratios similar to the materials which required removal from the Streeterville sites north of the Chicago River.

#### 4.0 SUMMARY OF FINDINGS

Two general areas were identified as exhibiting elevated gamma readings in the surface walkover survey. These areas are shown on Figure 2 and generally include the locations that the USEPA identified as exhibiting elevated gamma readings.

Downhole gamma survey results show from 1 foot to more than 10 feet of impacted soil. The majority of the downhole results show the impacted material to be relatively shallow. Some intervals with elevated gamma readings are at depths which would not be evident from surface surveys.

Gamma spectroscopy laboratory results show exceedances of the cleanup criteria established by USEPA. The radionuclides present appear typical of Streeterville materials in terms of the specific isotopes present and the ratios between the various radionuclides.

##### 4.1 Soil Volume Estimates

The volume estimates contained herein are based primarily on the surface surveys and downhole gamma results. Laboratory data did not materially influence the volume calculations. In order to be conservative in the volume estimates, that is in order to not under-estimate the volumes, "shine", the influence of impacted material on clean soil wherein the clean soil may appear impacted, was not used to reduce the apparent impacted thickness.

The following assumptions were used in developing the calculated volumes. These assumptions are intended to err on the conservative side, in order to reduce the potential to underestimate the volume of impacted soil.

1. If a 5 X 5 meter cell shows evidence of radiological impacts in the surface survey but no downhole data are available, a minimum of 1 foot of soil is assumed to be removed

from that cell. A 1-foot thickness of soil within a 5 X 5 meter cell equals approximately 10 cubic yards (c.y.).

2. Where adjacent borings show different depths of radiological impacts, the greater depth was given greater weighting in predicting the depth of remediation.
3. Where no horizontal limit is established by borings, the radiologically impacted material is assumed to extend half into the adjacent cell. Estimates of area underlain by impacted soil are made by adding the approximate fractions of adjacent cells and rounding to the next largest whole number.
4. Based on the volume of material evident in surface and subsurface survey results, it is anticipated the material to be removed will be approximately twice the measured volume. This factor of two represents the experience that there is at least the amount for which you have found evidence, and usually more.
5. At the request of the clients' representatives, a contingency estimate was developed. This contingency estimate was to predict maximum amount of material that might need to be removed. It should be recognized, however, that there is no guarantee intended in this maximum estimate. That contingency is recommended to be an additional factor of 2.

The volume estimates based on these assumptions are presented on Table 1. The identified volume is approximately 1,000 c.y. The anticipated volume given the likelihood of encountering more material than was identified is 2,000 c.y. The contingency estimate based on the maximum "outside" limit might be as high as 4,000 c.y., but includes a factor of 4 beyond the identified volume.

These volume estimates are based on the identified locations where material exceeding the cleanup criteria was encountered. Inasmuch as there will be construction excavations and site grading over most if not all of the subject site, and given that the shielding provided by soil could mask other areas from detection, if monitoring of excavation spoil is conducted in the course of construction, additional radiologically impacted areas may be identified. There is not sufficient information to provide an estimate of what volumes of impacted material might be encountered in the course of construction, if monitoring were to be conducted.

Note also that if permission is obtained to leave material on-site where risks to health and safety are acceptable, the material requiring removal would be accordingly reduced. USEPA and other regulatory agency approval would be required for this option to be considered.

#### **4.2 Remediation Cost Estimates**

The cost of remediating the identified contamination is based on experience with several vicinity remediation projects and certain assumptions as to material transportation and disposal. Those assumptions are summarized below.

1. On the previously completed removal projects from the Streeterville area north of the Chicago River, one of the responsible parties held a permit for disposal of the thorium-impacted soil. That permit was for disposal at a facility in Utah, which is one of the only facilities permitted to accept these low-level radioactive materials for disposal. In developing these costs, it was assumed that the work to be completed for this site would use that permit rather than attempting to obtain a new permit.
2. Transport to the disposal facility in Utah would be in intermodal containers, shipped by truck from the site to a rail yard in Blue Island and then by rail to Utah.
3. The cost for the transport and disposal on the previous projects was not disclosed, and we understand the cost information is proprietary based on the large volume of material shipped and disposed by the permit holder. However, a general estimate of \$10,000 per shipping container was reported anecdotally and is used herein for transport and disposal of a 10 c.y. container. This provides for a cost of \$1,000 per yard for transport and disposal if the material can be handled under the existing permit. Increased costs would likely be incurred if a new permit were to be required.
4. The excavation of the material may be included in part of the construction costs or may be separate from that work. The excavations may require certain engineering involvement to conduct the work in accordance with standard practices, and to maintain safe working and construction procedures. Monitoring radiation levels in the excavation will be required to confirm the limits of the cleanup. Air quality monitoring will be required to document that fugitive dust has not transported radioactive soil off site. A Work Plan and Health and Safety Plan will likely be required by the USEPA for the management of the removal effort. Laboratory testing and documentation will be necessary to confirm the removal complies with the cleanup standard. A closure report

will likely be required to provide a permanent record of the work completed, and to seek USEPA concurrence with the work. These management and documentation efforts may reach 25 percent of the transportation and disposal cost. The percentage becomes lower with larger quantities and may be higher for smaller quantities due to economies of scale. For this project and the 2,000 to 4,000 c.y. estimate, however, the 25 percent approximation appears appropriate.

These assumptions and approximations indicate that the removal and disposal of approximately 1,000 c.y. of radiologically impacted soil, if no more is found than was initially estimated, would cost \$1,000,000 for transport and disposal, and \$250,000 to \$300,000 for excavation, management, engineering and documentation. Under the contingency volume estimate where a factor of 4 is applied to the identified soil volume, the transportation and disposal cost estimate maximum may be \$4,000,000 and excavation, management, etc., could be \$1,000,000 for the 4,000 c.y. estimate.

## 5.0 CONCLUSIONS

STS conducted an investigation of radiologically impacted soil at the 26-acre subject site located in Chicago, Illinois. This investigation included a gamma survey of 3,870 5 x 5 meter cells that identified eight anomalies. Downhole gamma measurements were recorded in 35 soil borings at the site.

- Based upon the results of the surface and downhole surveys, STS identified approximately 1,000 c. y. of soil that warrant excavation and disposal. A contingency estimate of the maximum volume includes a factor of 4, increasing the estimate to 4,000 c.y.
- Based upon our experience performing similar work in the area, STS estimates that cleanup costs at the site will range from \$1,250,000 to the contingency maximum of \$5,000,000.

TABLES



**TABLE 1**  
**SOIL REMOVAL VOLUME CALCULATION**

**Southern Area**

Area *	Boring Number	Depth/Thickness (feet)	Open **	Number of Grids	Depth (feet)	Volume/ Cubic Yards
G-51	B-3, -4, -5	10', 2', 6'	E, NW	5	6 - 8'	300 @ 6' 400 @ 8'
I-52	B-4A, -8, -8A	4 - 5', 2 - 5', 1'	NE, W	3	3 - 5'	90 @ 3' 150 @ 5'
H-46	None	None Detected	All	2	Assume 1'	20
D-52.5	B-6, -7	None Detected	All	2	Assume 1'	20
						470 - 590

**Northern Area**

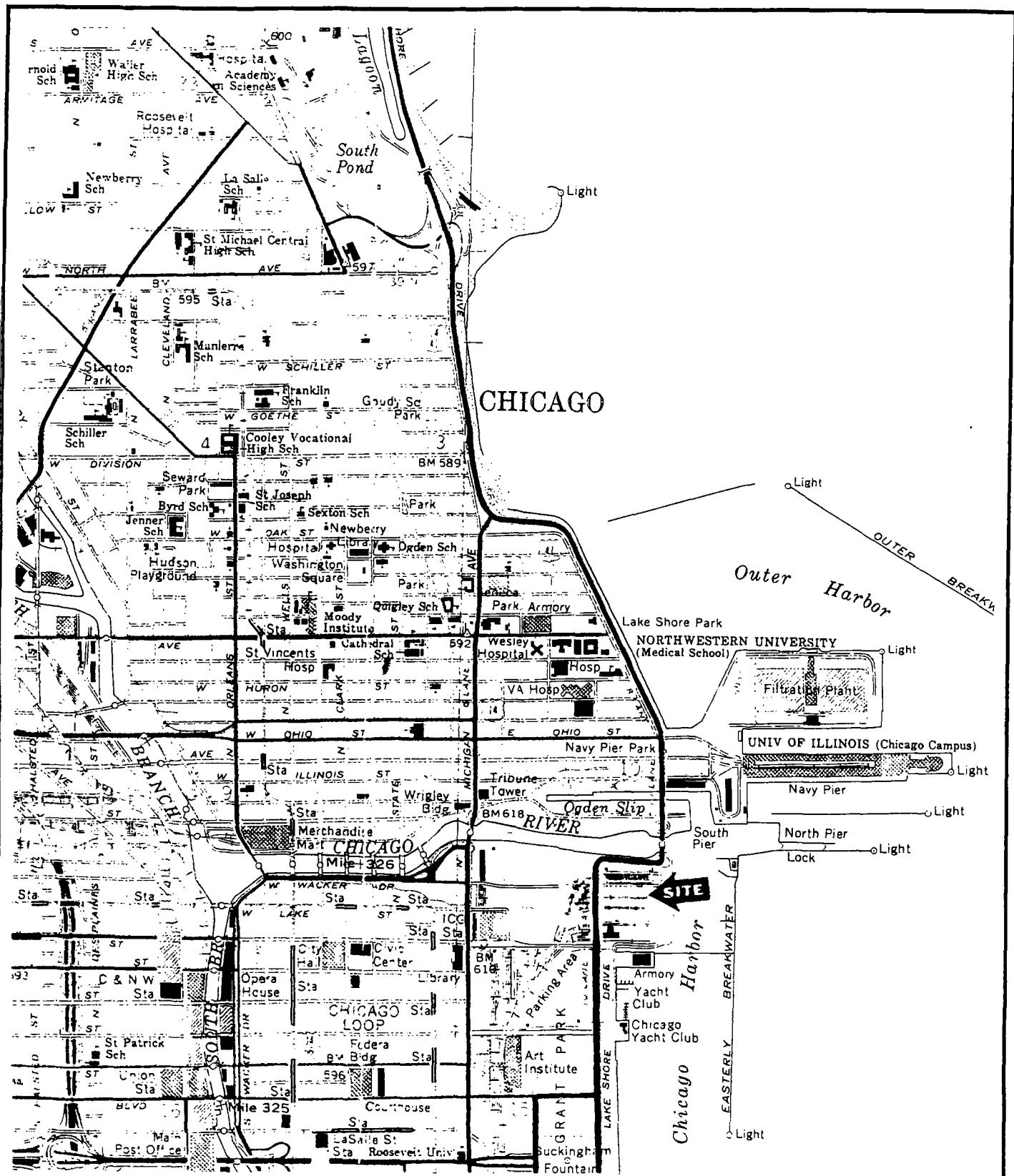
Area *	Boring Number	Depth/Thickness (feet)	Open **	Number of Grids	Depth (feet)	Volume/ Cubic Yards
OO.51	B-19, -19A, -19E	5', 6', 4'	--	3	6'	180
SS-50.5	B-18	1'	S	1	1'	10
PP-67	13-A	2'	N, E	2	2'	40
MM-66	12,12-A	2'	All Sides	5	2'	100
PP-59	None	None Detected	All	6	1'	60
MM-59	None	None Detected	All	3	1'	30
						430

Total 900 - 1,020 cubic yards - assume 1,000 cubic yards

\* Area approximately centered at this location

\*\* Open refers to directions where no borings are present to define the limits of extent of contamination.

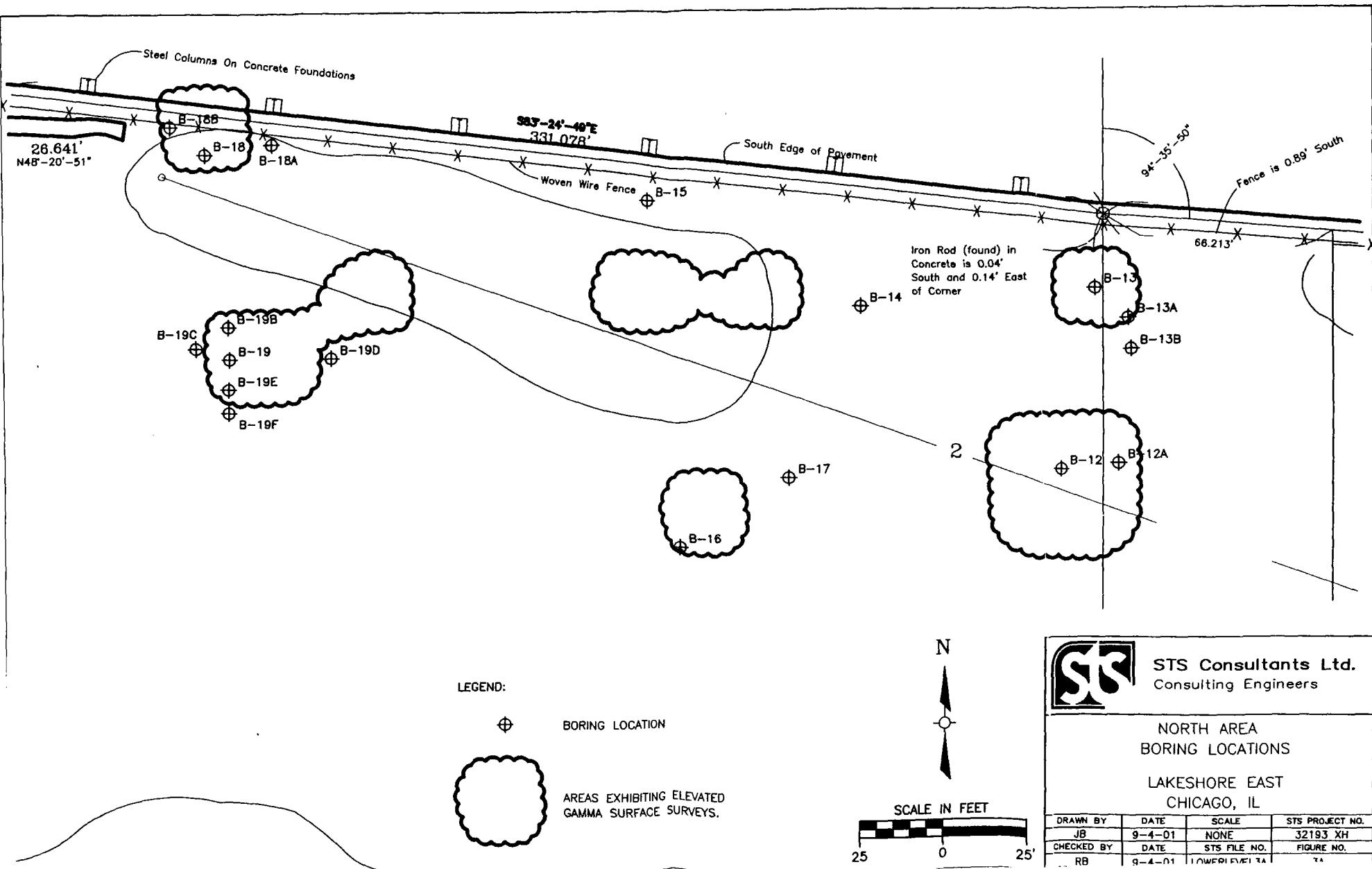
**FIGURES**



STS Consultants, Ltd.

Figure 1  
Site Location Map  
Lakeshore East Radiation Survey  
STS Project No. 1-32193-XH

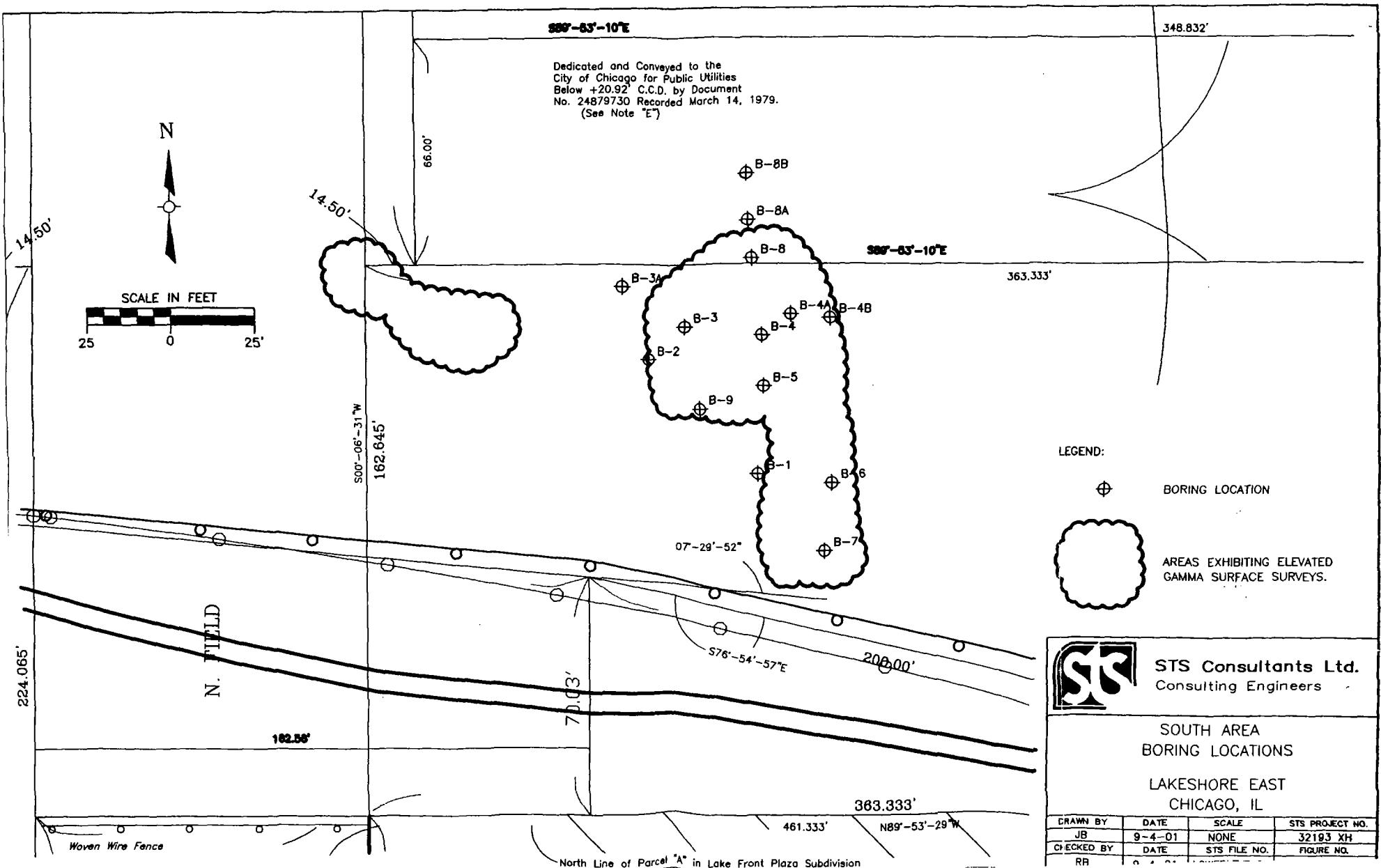
Date of Map:  
1963  
Approximate Scale:  
1:24,000



DRAWN BY	DATE	SCALE	STS PROJECT NO.
JB	9-4-01	NONE	32193 XH
CHECKED BY	DATE	STS FILE NO.	FIGURE NO.
RB	9-4-01	LOWFRIE/ELTA	7A

NORTH AREA  
 BORING LOCATIONS  
 LAKESHORE EAST  
 CHICAGO, IL

STS Consultants Ltd.  
 Consulting Engineers

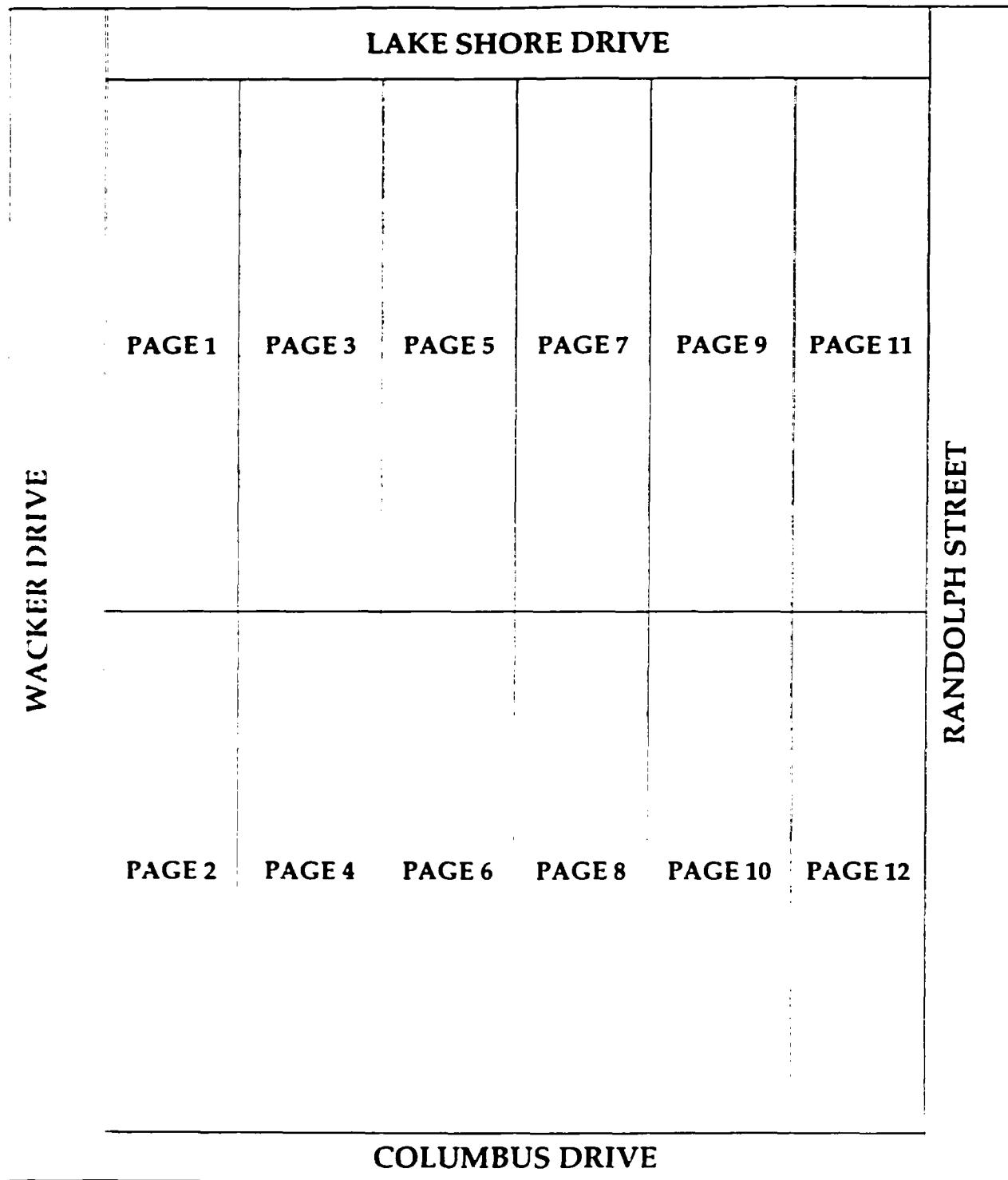


**APPENDIX A**

**SURFACE GAMMA SPREADSHEET**

# LAYOUT OF GAMMA SURVEY DATA SPREADSHEETS

← North



Gamma Survey Spreadsheet

WW	VV	UU	TT	SS	RR	QQ	PP	OO	NN	MM	LL
93							7600	7700	6400	6200	6400
92							7700	7600	6300	7000	6400
91							7300	7800	6100	5600	6800
90							7800	8100	7900	7900	7800
89							7600	7700	7700	7900	7700
88							7500	7800	8300	8400	7400
87							7700	8000	6900	5800	5400
86							7600	7800	7900	5500	5300
85							7100	7900	7200	6500	5300
84							7600	7700	7400	5400	5200
83							7000	7600	7500	5800	7100
82							7200	7300	7400	6800	6600
81							7200	7300	7200	6300	6500
80							7100	7600	7200	6900	7000
79							7600	7400	7100	7000	7800
78							7600	8000	6800	6800	7800
77							7600	7400	6800	6200	7200
76							7900	7200	7100	8100	6300
75							7600	7800	7700	8500	8100
74							7600	7700	7200	7200	8200
73							7600	7700	7400	6100	7200
72							7600	7600	7400	7500	8100
71							7500	7500	7300	8300	7700
70						7200	7600	7400	7600	8100	7100
69						7300	7400	7100	7800	8000	6400
68						6400	7200	7600	7400	7200	6800
67						6600	7900	8600	7700	7200	11,000
66						6800	7800	244000	7700	11500	180000
65						6900	7400	7600	7800	13000	180000
64						7500	8200	7300	8400	10600	13400
63						7400	8000	8100	9400	9300	9600
62						7400	11000	8300	9000	9400	9000
61						7700	8100	8300	8600	8700	10100
60						8100	7200	70000	17400	7400	9300
59						7300	6800	7000	7000	7300	8400
58						5900	8200	6900	375000	7300	6700
57						6300	8100	6400	6600	7400	8800
56						6900	7200	6700	6300	9200	9700
55						6400	7300	6600	8500	9400	9300
54						7300	7400	6600	6500	9900	9600
53						7400	7100	7700	24000	10100	10500
52						6600	6100	6000	10100	10200	10600
51						6700	6200	6700	8200	73000	10500
50						63500	6200	6000	8100	9300	9900
49						5300	7300	7600	7800	9400	10300
48						5100	6400	7600	8400	8300	9400
47						5800	6800	7300	7200	8700	9100
46						6000	6900	6400	6800	7600	9300
45						5900	6500	6900	5900	6800	7200
44						5900	7200	7100	6800	6400	7500
43						5300	6100	6700	6800	6600	7400
42						6200	7300	6200	7000	6700	6800
41						6500	7200	6400	6300	7400	7300
40						6800	5900	6100	6100	7300	7600
39						7000	5900	6300	6400	7600	7500
38						4800	7300	5200	6300	6100	7700
37						4700	7400	6400	5800	7300	8200
36						5100	7800	7900	8400	9600	9300
35						5300	7100	6800	6800	9200	8300
34						7200	6400	5200	5400	7400	7100
33						8300	7600	5700	6100	7600	7800

## Gamma Survey Spreadsheet

32		7700	8000	7500	7400	10000					6800	7000
31		7200	8000	7300	7700	10100						6300
30		6200	5700	5100	7900							
29		7200	6300	5300	7800							
28		7500	6800	7400	8200							
27	7000	8200	7600	8700								
26	6700	8000	8100									
25	7200	7600	8000									
24	7300	7700	7800									
23	7500	7800				6000	7100	6100				
22	5800	7600			6200	5900	5800	5600	7200			
21	7600	7500			5900	5700	5800	6000	5500	5600		
20	7400	7800			6000	6000	5700	5900	5700	5600		
19	7900	7900			5900	5800	5600	5800	6000			
18	9100	7700				6200	6200	6000	5800			
17	11000	7600					8000	7400				
16	13200	8100	9600				7900	8200				
15	12200	8700	8100	8300	7300	8000	7100	8300	8600		9600	
14	8150	8400	8600	8500	7400	10000	8600	8900	8600	9200	9400	
13												
12												
11												
10												
9												
8												
7												
6												
5												
4												
3												
2												
1												
WW	VV	UU	TT	SS	RR	OQ	PP	OO	NN	MM	LL	

Gamma Survey Spreadsheet

WW	KK	JJ	II	HH	GG	FF	EE	DD	CC	BB	AA
93											
92	6300	7600	7200	7100	7200	6800	7100	7000	7300	7100	7000
91	6500	6100	6000	6200	6300	5800	6200	6400	5700	6500	6700
90	5700	6100	6200	6600	6500	7300	6300	6000	5900	6300	6400
89	7600	7300	7400	7400	7500	7100	7600	6900	7000	8200	8400
88	8200	8100	8100	8200	7900	7100	7800	8000	8100	9000	7800
87	7200	7800	7200	7600	7700	10300	7700	8400	8100	8900	9100
86	5500	8000	7900	7600	9800	10600	8200	7600	7200	7900	8800
85	5500	7700	8000	8600	8100	8900	6700	7900	8300	7900	7600
84	8400	7900	7800	7300	7700	7800	6300	5800	7400	8700	8100
83	8900	7700	8200	8300	8700	8300	5400	6100	8200	8100	8800
82	8900	8300	8400	8700	8600	9200	6400	6300	7800	8400	7900
81	7400	7800	8200	8000	8200	9100	6200	6500	8000	7700	6100
80	8500	7800	8300	8200	8600	9200	7400	5600	7800	7200	5600
79	8300	8100	8200	8400	8100	8700	6300	5800	7800	7300	5600
78	8700	8000	8300	8300	8400	9100	7800	6100	6600	7200	6700
77	8800	8100	8000	8700	9200	8600	8100	6100	6700	6900	7200
76	6200	6300	6600	7800	8000	8600	8100	6400	6900	7000	6900
75	6200	6300	6800	7400	7700	8700	8400	6800	6700	7200	6900
74	5600	6000	6100	7800	8600	8900	8700	7600	6800	6700	6600
73	7600	6800	7100	8600	9400	10000	8500	8400	6300	6800	7600
72	7200	6800	7100	8200	8100	9200	8500	8000	6900	7000	7400
71	7100	7400	7700	7800	7900	8700	8900	7600	8200	6400	7400
70	8600	7600	8000	8200	8300	8100	7900	7200	7000	6200	6600
69	9200	7500	7700	8000	8100	8000	8300	6500	6200	6100	7700
68	8300	7400	7600	8000	7800	7700	7900	6200	5900	6800	8600
67	9100	9200	8700	8400	7900	8800	6000	6600	7100	7400	8700
66	18000	8600	8000	8100	8000	8600	6000	6200	6900	7800	8200
65	15000	8800	8000	7900	8000	6400	6200	6800	7000	7400	8200
64	10400	8400	8600	7700	8200	6200	6100	6100	6800	7100	8200
63	9200	8600	8800	9000	9100	6200	5600	5700	7600	7400	7200
62	9000	8700	8600	8100	8100	6100	5700	5600	6600	7700	8300
61	9000	8900	9400	8200	7400	7400	6900	6400	5500	6800	9300
60	8400	8600	8500	8500	7900	7500	6300	5600	6400	6200	9600
59	8700	8700	8900	7800	8500	7700	7000	6100	6400	8500	10100
58	8300	8200	8600	8400	8800	8300	8400	7000	6500	8300	9800
57	7800	7900	8300	8100	9500	9300	8800	7800	8400	7700	8300
56	9200	9000	8900	9100	8800	8800	9200	8300	8600	7900	9200
55	8900	8600	9100	8600	8400	8300	7300	8100	6800	7400	9400
54	9200	9100	8400	8400	6800	7400	7600	9300	6200	6900	8400
53	9200	9000	9200	9500	9400	7400	5800	6600	7800	7600	9400
52	8400	9600	9800	9100	8000	6500	5800	6300	6900	10000	10200
51	9400	10500	9800	9200	6500	6100	5100	5400	6300	8900	9600
50	9600	10300	9700	9400	7000	5700	6100	6100	7100	8400	9100
49	9600	9300	9100	8300	6600	5900	5300	6100	6800	8300	8100
48	9900	8700	7800	8100	6800	5300	5800	5700	6500	6200	6700
47	9100	8800	8700	7900	6100	6000	5100	5200	6100	6000	6100
46	7900	8300	8100	7200	6900	6300	6200	5600	6400	7000	7400
45	8600	9000	8400	8300	6600	7200	6400	6500	7100	7900	7200
44	8400	8600	8700	8400	7700	7500	7000	5600	7700	7800	7300
43	8600	8200	8100	7700	8100	8000	8100	8300	7200	8000	7700
42	8400	8300	7900	7800	7900	8000	8000	7400	7200	7400	7200
41	8200	7900	7400	8100	7800	7500	7200	7200	7100	6900	7000
40	7800	8100	8000	7700	7600	7700	8200	8000	6800	7300	7400
39	7800	7700	7800	7600	6200	8600	8000	8700	7200	7400	7700
38	7700	7800	7600	7400	7800	8000	8000	8600	7100	7400	8100
37	7700	8100	7600	7100	7200	7500	7600	8600	7000	7700	8000
36	6100	6000	6400	7100	8500	7700	8200	9300	8400	9600	13500
35	6300	6200	6600	7000	8400	8600	9100	9000	9800	9600	9700
34	7300	6400	6500	7100	8600	8700	8800	8600	10000	9700	9500
33	6600	6500	6400	7100	7900	8200	8600	10000	9800	9900	10000

Gamma Survey Spreadsheet

32	7200	6200	6300	6400	7400	8200	7800	9300	9900	10000	9800
31	6600	6800	6600	7100	7500	8300	8400	9100	10100	10300	9800
30	5700	6800	6700	6900	6900	7700	8000	8600	9900	11200	10100
29		7800	6000	6500	7300	8500	7400	8200	9800	9400	10100
28		7800	6500	6500	7500	8300	7900	7900	7800	8000	10100
27		8900	6300	6200	8200	8500	8300	8700	9600	10000	11100
26			8400	6400	8500	8600	6900	8700	9400	9400	10500
25			6800	6800	8400	9000	8300	9100	9700	9800	10300
24			6700	6900	8700	8000	8200	9400	9700	10800	11500
23			6400	6500	8700	7900	8300	9800	9600	9700	10600
22			6300	6700	6600	8200	8400	8800	8500	8800	9900
21			6900	6800	6700	8700	8000	8700	8700	8400	8800
20			7300	7100	6800	8500	6800	8600	9000	8900	8700
19			7400	7200	7200	8800	8800	9000	9900	9800	10100
18			7400	7000	8600	9200	10000	9100	9400	9700	10000
17	6400	6600	7100	8600	8400	9000	8700	8800	9400	9700	10100
16	7600	8100	8400	8800	8900	8600	9700	9600	9500	9700	10300
15	9300	9600	8300	8200	8600	9400	10800	10200	8600	9100	8900
14	8700	9100	8100	7900	9500	7700	8900	9100	9400	9700	10200
13	7400	8600	8100	8100	7200	6800	7500	8900	9400	9300	9100
12	9100	10000	10100	7700	6600	6500	6700	6500	8600	8300	8200
11	9200	9800	7900	7200	6600	6500	6800	6600	6600	6800	6900
10	8700	6300	6500	6400					6700	6800	6900
9	8200	7300	6900	7200					6800	6600	6700
8	8100	7100	7000	6400					7000	6900	7000
7	8200	8100	7100						7000	7100	7000
6	8100	8200	8300	7200					7600	7100	7000
5											
4											
3											
2											
1											
WW	KK	JJ	II	HH	GG	FF	EE	DD	CC	BB	AA

Gamma Survey Spreadsheet

WW	Z	Y	X	W	V	U	T	S	R	Q	P
93											
92	7100	6600	7200	7200	7100	7400	8300	8600	8000	7800	7300
91	6600	6300	7200	7100	6900	7500	8500	9100	9100	7700	5700
90	5900	5700	6800	6600	6800	7400	8500	8000	8100	6700	5600
89	8000	6300	5800	5700	6100	7400	8400	8100	8500	6000	5600
88	6900	6200	5900	6300	6200	7400	7300	9000	8200	6800	5500
87	8300	7100	6300	6800	6900	7600	7500	8300	6200	7100	6700
86	9200	8900	7700	7600	7700	7800	8100	8200	6900	6800	6600
85	7600	8300	8600	8400	7900	8300	8300	8400	6700	7300	7800
84	9000	8200	7400	7300	7800	7100	8000	7500	7200	7700	7800
83	7600	8000	7300	7600	7100	7200	6100	6200	7700	8150	7100
82	7800	7200	7400	7100	7500	7600	5300	5800	6300	7300	8100
81	5300	6200	7100	7400	7500	7300	5800	5400	6100	7800	8100
80	5300	5400	6700	7800	7300	7400	6200	5400	5800	7600	8400
79	5100	5700	6100	6300	7200	7400	7800	5500	6100	7900	8000
78	5800	5300	6400	6900	7600	8100	7700	7700	7300	7000	7600
77	6600	6500	7100	7200	8400	8600	7800	8000	7700	8000	13000
76	6700	7800	8500	8800	7700	7600	8500	8100	8300	7700	8000
75	7000	7200	8100	7700	8600	8100	8100	8000	9300	9700	8200
74	7000	7200	7600	7800	7700	7600	6600	8100	7500	7200	7500
73	7100	6800	7500	9000	9300	8200	7200	7100	8800	8800	6700
72	6900	6700	7500	7400	9000	8600	8200	8100	6600	6000	5700
71	7100	6800	7200	7100	8300	8400	8400	5600	5800	5700	5700
70	6700	6300	7050	7200	8100	8200	7200	5700	5800	5400	5800
69	7800	6100	17100	7000	7700	8300	8500	5600	6000	5800	6300
68	7100	6600	6700	6500	7300	7600	8100	7700	7500	6800	7800
67	8200	7200	6600	6400	7200	8500	9000	8000	8100	7800	8100
66	8200	8000	7000	7200	7300	8200	8600	7900	7900	8500	8600
65	8100	8500	7600	7300	7200	8100	8500	8400	7300	7600	7500
64	8900	8200	7800	8300	8100	7900	8000	7600	7900	7400	7500
63	8100	9000	7900	8100	7700	8000	7400	8100	8500	7500	6300
62	8200	7800	7300	7700	7800	7900	5800	6100	5800	5400	6700
61	8400	9000	8900	9600	6700	5900	6400	6600	6300	7000	7100
60	7800	9300	8700	9400	6600	6400	6400	6500	6800	6700	6800
59	9600	9400	10200	9400	6500	6300	6200	6600	6700	6700	6600
58	9500	9600	9100	9200	6600	6500	6600	7000	6800	6400	6800
57	8900	9600	9900	9800	7000	6600	6700	6500	6400	6800	7100
56	9200	9500	9600	9800	6800	6800	6700	7000	6900	6600	6800
55	9300	9300	9800	9200	6900	8000	8100	8800	7900	8800	10100
54	9300	9600	10400	9600	9400	8200	8400	8100	8100	9600	9800
53	8900	9500	9200	9900	9400	9200	9800	9400	8900	9500	9600
52	9300	9100	9000	9600	9500	9300	9700	9800	9400	10000	9800
51	9800	8800	8700	8900	9100	9400	9700	9800	10200	9200	10200
50	9400	9300	9200	8600	8800	9800	9100	9000	9200	9100	8200
49	8800	9700	8600	8800	8400	9100	9200	8400	8700	7400	7100
48	8100	8200	8000	8400	8300	9100	9200	8100	7600	6400	9800
47	7800	8600	8500	8400	8700	9200	8400	8100	7500	7900	8400
46	9400	9100	9200	8700	8400	8300	8100	8400	7800	8300	8600
45	8400	8900	9900	8700	8600	8700	8100	7400	7700	7200	8400
44	7300	8000	8100	8000	8300	7600	7500	7800	7400	7400	7400
43	7700	7400	7700	8100	8100	7600	7600	7400	7300	7600	8100
42	7200	7800	7600	8400	7800	8100	7800	7700	7600	7000	6900
41	7100	7100	7200	7500	8000	8100	7700	7600	7800	7700	7500
40	7500	8000	7300	8000	7800	7600	7600	8000	8100	7300	7600
39	7800	7000	6900	7800	8200	8000	7500	7300	7800	7700	7900
38	8900	8300	8100	8000	8000	7900	7800	7700	7900	7300	8400
37	8200	8500	8900	8000	9000	7900	8100	8300	8200	7800	8100
36	9700	9000	7000	9400	9300	9100	8900	7800	7500	8200	7900
35	9700	9700	9200	11000	8000	10200	9900	8700	7100	8200	8100
34	9600	9200	9600	9400	9400	9600	8900	7600	7400	8500	9000
33	9900	10500	10600	10600	10100	9400	8700	8100	7700	9200	9500

Gamma Survey Spreadsheet

32	9800	10900	9000	8400	9600	10100	9100	9100	9000	9800	8900
31	9900	10600	9800	8300	10000	10000	9000	8900	9000	9000	9400
30	10000	10350	10200	10300	8300	9400	9000	8600	8400	10100	9000
29	10200	10000	9100	9000	7800	9000	8700	8400	8600	8800	8600
28	10100	11000	10300	9000			9400	9600	10000	9800	9300
27	8700	10600					9800	10100	10200	10000	10300
26	10300	9600				9400	9800	10100	10900	11800	10200
25	11100	11300	11100	11100	11900	9700	9800	10100	10300	10600	10200
24	10200	10700	10600	10600	10700	10100	10200	9900	9800	10900	11800
23	10100	10000	9000	9900	9300	9900	10800	10100	9700	10100	8900
22	8500	8700	8800	9300	9600	10300	9400	9600	9600	10100	8300
21	8600	8700	8600	9200	9000	8700	9100	8900	11100	9200	8900
20	9000	10400	10300	9800	9900	9200	9200	9400	9000	9100	9300
19	9900	11300	11000	10000	11000	9700	9400	9400	9300	9800	9500
18	11400	10600	11100	10300	11800	11500	10100	9700	9700	9600	10100
17	10400	10200	11000	10800	10700	10500	9600	9100	8700	9500	10000
16	10100	10100	10600	11700	10800	11200	9700	8600	9100	9600	9800
15	10200	10200	11400	11200	12900	9200	9100	9000	8900	9400	9600
14	12600	12000	10800	11200	11000	9800	9400	8900	9200	9800	10100
13	9200	9700	10000	10500	10700	9900	8700	8800	8400	9500	9800
12	8000	9700	9500	9500	10300	10100	8900	9400	8400	9200	9600
11	7800	8800	9200	9300	9500	8700	9100	8800	8500	8700	9400
10	6500	6700	6700	7300	8300	7900	7600	7800	7800	7900	8300
9	6800	6700	7200	7000	6900	8000	7800	7700	8100	6500	6600
8	6800	6900	7200	7100	7100	7700	7600	7100	7100	6500	6500
7	6900	6700	7100	6900	7200	6700	7000	6900	6900	6700	6500
6	7200	7200	6800	6700	7000	6400	6500	6400	6300	6500	6500
5	6600	7200	6200	7400	6800	6300	6200	6400	6300	6400	6400
4		7600	8100	7200	8000	8100	7900	8300	7900	6500	6300
3		10500	9500	9600	8600	8200	8500	7700	7800	8700	8800
2					9300	8900	7900	8500	7700	8900	9400
1					10200	8700	9100	8900	8600	9200	8700
WW	Z	Y	X	W	V	U	T	S	R	O	P

## Gamma Survey Spreadsheet

WW	O	N	M	L	K	J	I	H	G	F	E
93											
92	6900										
91	7500	7000									
90	5900	6900	7200								
89	6100	6000	8400								
88	6300	5700	7800								
87	5600	6400	8100								
86	6300	6400	7800								
85	6400	6300	8000								
84	5800	6800	8500								
83	6200	6400	8200								
82	7200	6400	8700								
81	7100	6300	8400								
80	7700	7300	8400	8500							
79	7500	7400	8400	9300							
78	7500	7300	8500	8000							
77	7700	6000	8400	7000							
76	6700	6200	9100	7900							
75	6500	7500	8600	8000							
74	6700	6900	8300	8800							
73	7000	7000	10000	7300							
72	6000	6000	9000	8600							
71	5800	7800	9100	8000							
70	6500	8200	8900								
69	7800	8700	8900								
68	6900	9000	8700								
67	7300	8400	8300								
66	8300	8500	8600	8000							
65	8800	8300	7600	8100	8700						
64	6700	7100	8100	8600	8800	8900	9200	9400	9000	8900	8800
63	6700	6200	7600	7900	8800	8700	8700	9500	8800	8800	9500
62	6800	6800	6600	7400	7300	7200	7400	7700	7400	7800	9000
61	6500	6400	7500	7900	7600	7900	6500	6800	6300	7300	6560
60	6700	6500	7000	7200	8100	7250	7500	7900	7500	7700	7600
59	6800	6800	7200	8200	7600	7100	7300	7400	7200	7700	7500
58	6300	6900	7300	7400	7900	7100	7100	7800	7400	6900	8100
57	6600	6700	7400	7500	7500	7700	7400	7200	7300	7900	8000
56	7000	6800	7200	7600	7550	8000	6000	7000	7340	7300	6800
55	8500	8800	9700	10000	9700	8200	6300	6150	6800	6700	7120
54	10300	10200	10000	10300	10400	9800	9500	9185	9600	9300	10114
53	9200	9400	9500	9700	10000	11000	11799	10151	10418	12300	10245
52	7400	8200	9900	10100	10100	11300	10900	12400	20000	25000	15900
51	8200	7400	8600	9800	9800	11100	11600	40900	278000	626000	16200
50	6800	8400	9600	10100	10500	10600	12500	15400	50000	30000	16000
49	9600	9200	9400	9800	10000	10400	10800	12000	12400	31000	14000
48	9300	9600	9800	10400	10500	11000	15549	13413	11305	12800	12605
47	8600	8100	10500	10300	10400	10600	9998	10157	19500	10520	10095
46	8900	8400	8900	10900	9900	10800	9037	9305	28840	11809	11610
45	8700	8100	8400	9400	8300	9200	8831	12498	13605	10377	11711
44	7500	8100	8400	8500	8800	8900	10400	20000	16000	10400	10500
43	8300	7800	8300	8300	8500	9300	9400	14700	10400	10000	10000
42	7300	7400	7400	8500	8700	9000	10000	14000	9100	10600	11300
41	6800	7000	8300	8300	8200	8700	9100	8500	8300	10400	8700
40	7200	6800	8300	8000	8500	9000	7310	9469	7800	8980	8640
39	7600	7200	6800	7600	9000	8400	8260	9010	9091	8511	8683
38	8300	7600	7700	7800	7900	8500	8610	8415	8710	8090	7900
37	7900	7300	8600	8100	8000	8500	8406	10050	8260	8027	8037
36	8300	8900	8800	9400	9100	8800	9500	10500	9100	9600	9700
35	8600	9200	9200	9300	8700	8700	9500	9500	11500	11300	11000
34	9200	9800	8200	9200	9200	8500	8500	8300	7400	9800	11200
33	9100	9000	9000	8400	9800	9200	8400	8600	8500	8700	10500

Gamma Survey Spreadsheet

	32	8800	8600	8800	9000	8300	8400	8300	7200	7800	8400	8800
	31	9200	8600	8300	8100	9600	8700	8700	8200	8000	7800	8500
	30	8600	8200	9000	8000	9000	10600	8500	7900	7700	7600	7400
	29	9000	8600	10200	8900	9800	9400	8300	7200	7700	7300	7000
	28	9900	10700	7800	9900	9600	9700	8615	7180	7402	7694	7214
	27	10200	10100	10200	10500	11100	9700	8460	7420	8014	8205	7209
	26	9900	9800	9200	10700	10400	10000	8000	7800	7500	8463	7390
	25	10700	9600	9800	9800	11400	10400	9150	8100	8200	8200	9100
	24	7400	7600	9100	9700	11300	10300	8900	9400	9200	9600	9400
	23	7700	9700	10100	9600	8800	9500	9400	8700	8600	9300	11300
	22	7600	8900	9000	9200	9600	9800	10000	9300	10100	9600	8800
	21	7800	8700	9600	9200	9000	10700	10500	8700	8900	9600	9200
	20	9400	9500	10300	10000	9800	10600	9600	8800	8600	9500	9000
	19	10300	10100	10200	10800	9200	9400	8500	9300	9200	9070	7900
	18	9800	10300	10500	10300	9500	10000	9500	9000	9600	8500	8000
	17	10200	9900	11000	10300	10500	11100	8600	9300	9400	9800	9200
	16	10100	9800	11200	11200	11000	10600	9500	9100	9600	10000	9000
	15	10500	10100	12200	10600	11000	11100	10400	10300	10200	10000	10250
	14	10400	10200	11100	11800	10900	10700	9300	9700	9800	10000	10000
	13	9400	10200	11120	10700	10300	10300	8800	9500	9200	10100	10500
	12	9700	9700	10100	10200	9700	10100	9300	9100	9600	10500	11000
	11	9300	9700	10350	10300	10100	9200	8700	8750	8700	9400	9600
	10	8600	8700	9100	10500	9200	9100	8500	8400	8600	8100	8100
	9	6400	6500	6800	7400	6900	7200	5600	5900	6300	6300	6100
	8	5800	6700	7000	7300	7500	7300	5600	5800	5800	5800	5600
	7	5300	5400	6700	6300	6700	7100	6500	6700	6700	6600	6900
	6	5200	6300	6400	6300	7000	7100	6700	6600	7200	6300	7100
	5	6400	6500	6500	6600	7000	6900	6400	6200	6600	8300	8100
	4	6700	6600	7100	7200	7300	7200	5600	5700	6600	6590	6300
	3	9300	9400	8800	8300	8900	9000	6900	7200	7290	7300	7750
	2	9200	8800	8800	9700	9600	9800	8750	8834	8560	8000	7300
	1	7900	3000	8300	9900	10300	10100	8100	9200	8600	7400	7900
www	C	N	M	L	K	J	I	H	G	F	E	

Gamma Survey Spreadsheet

WW	D	C	B	A	A-	B-	C-	D-	E-	F-	G-
93											
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65											
64	9000	9600									
63	9100	9500	9800	10100	8700	10000	9300				
62	9000	9000	10200	10300	8900	8900	8500				
61	6898	7900	7800	8000	9200	8700	8700				
60	7600	7900	8500	9300	10100	9300	8500				
59	7600	8200	8900	8400	9500	8700	8600				
58	7500	8000	8300	8500	9500	9700	9600				
57	8000	8400	8700	8400	9400	9900	9900				
56	7470	7278	7410	8200	9400	9900	9300				
55	7525	7111	7580	8900	10500	9000	9000				
54	9105	7415	7400	8800	9800	9400	9300				
53	11144	13445	9066	9900	9600	9600	9300				
52	43000	30000	10700	10600	9400	9200	8900				
51	17000	12200	10700	10700	9600	9800	8200				
50	13500	10500	10300	9300	9800	10200	9600				
49	13000	11100	10900	10200	9800	10000	9500				
48	11384	10000	11300	10300	9900	9800	7800				
47	11497	9800	11500	10500	9500	9500	9400				
46	9605	9200	9200	10000	9500	9400	9300				
45	9083	8410	9400	8800	10000	9000					
44	10000	9200	8400	8500	9400	8500					
43	8800	8900	8500	8500							
42	8900	7200	7300	7900							
41	7700	7600	7500	7400							
40	8410	7100	7100	7200							
39	9760	7700	7200	6900							
38	6900	7400	6500	6900	8500	8400	8300	7400	9600	9100	
37	6600	7400	7700	7200	8800	9800	9000	9000	9400	8900	
36	10200	7100	7300	7800	8900	8900	9400	9400	9400	9200	9000
35	7800	7100	7500	7200	8700	9400	8600	9400	9400	8700	
34	8200	6900	6900	8100	8800	8600	8600	8900	9000	8800	
33	8900	7400	7500	7800	8900	8300	9200	9200	9100	8800	

Gamma Survey Spreadsheet

	32	8300	7100	7800	7900	8700	9100	10000	9300	9200	8700	
	31	7900	7900	7800	7500	8400	9700	9100	9000	8900	8600	
	30	6900	7400	7100	7300	8600	8700	8500	8900	8900	8800	
	29	7000	8100	7300	7500	8100	8700	9100	9500	9200	8900	
	28	7800	8400	9200	8700	9000	9100	9000	10800	9100	8800	
	27	7900	8100	8000	8300	9700	9700	9800	10500	10000	8900	9000
	26	8300	8100	7900	7800	9700	9700	9900	11800	10600	9600	9000
	25	7700	7680	8600	8500	9100	9600	10400	10700	11600	12100	9400
	24	8000	8700	8500	8500	9500	9800	10600	9500	9400	10200	9200
	23	8000	8500	8600	8500	9700	10200	9500	9100	9300	9200	9300
	22	8500	8500	8500	9100	9200	9100	8800	8500	9400	9000	8700
	21	8400	8500	7800	8500	9800	10200	8400	8800	9600	9100	8600
	20	8300	9000	8700	8700	9800	9700	9700	8400	10100	9200	8400
	19	8600	8600	8700	8700	9400	9400	10200	8900	9800	9100	8600
	18	8500	8700	8500	9400	9700	9400	10400	9800	8900	9100	9000
	17	8100	8500	8900	8200	9000	9700	10700	9600	8800	9100	8700
	16	8300	8900	8900	8700	9600	9600	11000	10100	8900	9200	8800
	15	9000	8300	7900	8700	9800	9200	9500	8900	8600	9100	8700
	14	9000	9000	9000	7300	9100	9400	9800	9100	8700	8000	8100
	13	9000	8200	8000	7300	9100	9000	9000	8900	9200	7900	7900
	12	9200	7700	7200	8300	8900	9000	8400	8600	8600	8200	9400
	11	9200	7900	8000	8400	8800	8300	9100	8700	8700	8800	8700
	10	8100										
	9	6000										
	8	7800										
	7	9700										
	6	3600										
	5	9500										
	4	8900										
	3	8350										
	2	5600										
	1	8700										
WW	D	C	B	A	A-	B-	C-	D-	E-	F-	G-	

### Gamma Survey Spreadsheet

WW	H-	I-	J-	K-	L-	M-	N-	O-	P-	Q-	R-
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## Gamma Survey Spreadsheet

32												
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28												
27	8800	9500	9800	9400	9800							
26	9700	9600	9700	9600	9800							
25	9100	9200	8500	8400	8700							
24	9200	9100	8900	8500	9200	9000	9100	8900	9000	7400		
23	8900	8500	9200	8400	8900	8900	10000	9300	8000	7600		
22	8600	9000	8600	8700	8400	8500	8800	8400	8600	7400		
21	8900	9200	8700	8300	8700	9400	9100	9400	8100	7800		
20	8800	8800	8700	9600	9700	8300	9100	8100	7900	7700		
19	8700	8700	7800	8800	8400	8700	8300	7900	8300	7800		
18	9000	8500	7900	8700	9800	9300	9300	8800	8900	8000		
17	9200	8800	8200	10000	9300	9500	8900	8700	9700	7800		
16	8900	8500	8300	8800	8600	9400	9100	9000	9000	7800		
15	9000	8600	8900	7800	8600	9400	9300	11600	8800	7700		
14	9700	11800	9200	8900	9200	8400	9400	13900	8600	8300		
13	9400	9100	9300	8800	9000	8800	8200	7800	6900	8300		
12	9200	9000	8900	8800	9000	8700	8000	8000	7600	8200		
11	8900	9600	9000	8800	8100	8400	8300	8100	7800	8800		
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WW	H-	I-	J-	K-	L-	M-	N-	O-	P-	Q-	R-	

**APPENDIX B**  
**DOWNHOLE GAMMA READINGS**

## NORTHERN AREA DOWNHOLE GAMMA DATA

Boring Number	Location (site 5 meter grid)	Depth (feet)	Gamma Exceedance Intervals (feet below ground surface)
12	MM-66	9' 3"	0 - 1.5'
12A	MM-66.5	9' 4"	0 - 1'
13	PP.5-66.5	9' 1"	--
13A	PP-67	9' 5"	0 - 2'
13B	OO.5-67	9' 4"	--
14	PP-62.5	9' 3"	--
15	SS.5-58.25	8' 8"	--
16	LL-59	9' 6"	--
17	MM-61	9' 3"	--
18	SS-50.5	9'	0 - 2'
18A	TT.5-51.5	9' 4"	--
18B	TT.5-5.0	9' 7"	--
19	OO.5-51	9" 4"	0 - 5'
19A	00.5-51.5	9'	2 - 6'
19B	PP-51	9' 7"	--
19C	OO.5-50.5	9' 5"	--
19D	OO.5-52.5	9' 7"	--
19E	OO-51	9' 5"	1.5 - 4'
19F	NN.5-51	9' 5"	--

Highlighted borings/depths exceed USEPA cleanup level.

Date: 08/17/01Instrument Model # Ludlum 2221Technician Tol, S Lewin  
Operational Check 12770 cpmSerial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Cutoff Value =  $7.1 \text{ pCi/gm} = x \text{ cpm}$  cal. bated for  
5,574 counts per 30 Sec. steel, PVC vsp

10'

Boring # MM 66 (Max Depth 9' ft) 9" ext

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	31251	15.5	
1	10622	16	
1.5	6172	16.5	
2	4669	17	
2.5	4317	17.5	
3	4364	18	
3.5	4308	18.5	
4	4380	19	
4.5	5238	19.5	
5	4803	20	
5.5	4666	20.5	
6	4442	21	
6.5	3890	21.5	
7	4187	22	
7.5	4141	22.5	
8	4108	23	
8.5	4342	23.5	
9	4803	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lake Shore  
EastDate: 08/13/01Instrument Model # Ludlum 2221Serial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Technician Toby Shawan  
Operational Check 12770 cpmCutoff Value = 7.1 pCi/gm = calibrated for  
5,574 counts per 30 Sec. steel, PVC usedBoring #MM-66<sup>.25</sup> (Max Depth 9 ft)  
4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	9178	15.5	
1	5801	16	
1.5	5086	16.5	
2	4720	17	
2.5	3941	17.5	
3	4784	18	
3.5	4480	18.5	
4	3864	19	
4.5	3571	19.5	
5	4175	20	
5.5	4491	20.5	
6	4664	21	
6.5	4552	21.5	
7	4413	22	
7.5	4615	22.5	
8	4914	23	
8.5	5102	23.5	
9	5166	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01Instrument Model # Ludlum 2221Technician Tob Stewart  
Operational Check 12140 cpmSerial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Cutoff Value = 7.1 pCi/gm = to calibrate for  
5,574 counts per 30 Sec. Steel, PVC used

PP.5-66.5

Boring # - (Max Depth 9 ft)

1"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	1980	15.5	
1	2115	16	
1.5	1733	16.5	
2	2101	17	
2.5	2755	17.5	
3	2715	18	
3.5	2566	18.5	
4	2400	19	
4.5	2517	19.5	
5	2925	20	
5.5	2873	20.5	
6	2479	21	
6.5	2179	21.5	
7	2275	22	
7.5	2139	22.5	
8	2122	23	
8.5	2133	23.5	
9	1955	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01Instrument Model # Ludlum 2221Serial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Technician Toby Shawan  
Operational Check 12/14/01Cutoff Value = 7.1 pCi/gm =  
5,574 counts per 30 Sec.**Boring #Pf-67 (Max Depth 9 ft)**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	245.917	15.5	
1	269.930	16	
1.5	47.196	16.5	
2	10.348	17	
2.5	4.302	17.5	
3	2708	18	
3.5	2415	18.5	
4	2615	19	
4.5	2629	19.5	
5	2512	20	
5.5	2369	20.5	
6	2030	21	
6.5	2257	21.5	
7	2375	22	
7.5	2322	22.5	
8	2858	23	
8.5	3294	23.5	
9	3370	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01Instrument Model # Ludlum 2221Technician Tob, Shown  
Operational Check 12140 cpmSerial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Cutoff Value = 7.1 pCi/gm = \* calibrated for  
5,574 counts per 30 Sec. Std. PVC used

00.5-67

Boring #00 - (Max Depth 9 ft)  
4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2379	15.5	
1	2265	16	
1.5	2061	16.5	
2	2940	17	
2.5	2959	17.5	
3	2491	18	
3.5	2419	18.5	
4	2587	19	
4.5	2466	19.5	
5	2306	20	
5.5	2365	20.5	
6	2431	21	
6.5	2777	21.5	
7	3315	22	
7.5	2977	22.5	
8	3645	23	
8.5	3397	23.5	
9	3219	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/17/01  
 Instrument Model #: Ludlum 2221  
 Serial #: 126497  
 Probe Model #: PR 44-10  
 Serial #: 171991  
 • Shielded (2")

Technician Toby Shewan  
 Operational Check 12140 cps

Cutoff Value = 7.1 pCi/gm  $\Rightarrow$  Calibrated for  
 5,574 counts per 30 Sec. Step 1, PVC  
 used

55.5 - 58.25  
 Boring # - (Max Depth 8 ft)  
 8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2876	15.5	
1	2999	16	
1.5	1568	16.5	
2	2165	17	
2.5	2871	17.5	
3	3262	18	
3.5	2907	18.5	
4	2321	19	
4.5	1989	19.5	
5	1783	20	
5.5	1736	20.5	
6	1888	21	
6.5	2197	21.5	
7	2582	22	
7.5	2391	22.5	
8	2077	23	
8.5	2181	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shawan  
Operational Check 12140 cpm

Cutoff Value = 7.1 pCi/gm = ~~4~~ calibrated for  
5,574 counts per 30 Sec. steel, PVC was  
used

Boring #LL-59 (Max Depth 9' ft)  
6"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2673	15.5	
1	3652	16	
1.5	4688	16.5	
2	4208	17	
2.5	3376	17.5	
3	2386	18	
3.5	2975	18.5	
4	3348	19	
4.5	3525	19.5	
5	3562	20	
5.5	3618	20.5	
6	3574	21	
6.5	4222	21.5	
7	4786	22	
7.5	5377	22.5	
8	5487	23	
8.5	5272	23.5	
9	5231	24	
9.5	5383	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01Instrument Model #: Ludlum 2221Technician Toby StevanOperational Check 12452Serial # 126497Probe Model #: PR 44-10Serial # 171991

• Shielded (2")

Cutoff Value = 7.1 pCi/gm = Calibrated for  
5,574 counts per 30 Sec. Stab. PVC  
was usedBoring # 55-505 (Max Depth 9 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	44,607	15.5	
1	341,398	16	
1.5	82,508	16.5	
2	12,665	17	
2.5	5,490	17.5	
3	3,497	18	
3.5	2637	18.5	
4	2168	19	
4.5	1984	19.5	
5	1934	20	
5.5	2380	20.5	
6	2141	21	
6.5	1842	21.5	
7	1780	22	
7.5	2231	22.5	
8	1820	23	
8.5	1663	23.5	
9	1558	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 6/14/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12140 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated for  
5,574 counts per 30 Sec. Steel, PVC was  
used

**Boring #M1-61 (Max Depth 9 ft)**  
**3"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2689	15.5	
1	2999	16	
1.5	3161	16.5	
2	3360	17	
2.5	3421	17.5	
3	3408	18	
3.5	3127	18.5	
4	2783	19	
4.5	3110	19.5	
5	3149	20	
5.5	3005	20.5	
6	2928	21	
6.5	2882	21.5	
7	2808	22	
7.5	2728	22.5	
8	2795	23	
8.5	2777	23.5	
9	2643	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01  
 Instrument Model #: Ludium 2221  
 Serial #: 126497  
 Probe Model #: PR 44-10  
 Serial #: 171991  
 • Shielded (2")

Technician Toby Shawan  
 Operational Check 12452 cpm

Cutoff Value = 7.1 pCi/gm = ✓ calibrated for  
 5,574 counts per 30 Sec. Steel, PVC was  
 used

**TT-5-51.5**  
**Boring #** (Max Depth 9 ft)

4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2211	15.5	
1	2868	16	
1.5	2445	16.5	
2	1838	17	
2.5	2431	17.5	
3	2556	18	
3.5	2546	18.5	
4	1998	19	
4.5	2213	19.5	
5	2523	20	
5.5	2058	20.5	
6	1800	21	
6.5	1654	21.5	
7	1624	22	
7.5	1811	22.5	
8	1646	23	
8.5	1658	23.5	
9	1669	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 8/15/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shawan  
Operational Check 12452 cpm

Cutoff Value = 7.1 pCi/gm = calibrated for  
5,574 counts per 30 Sec. Steel, PVC was  
used

Boring # TT:5 - 50  
(Max Depth 9 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2413	15.5	
1	2549	16	
1.5	2165	16.5	
2	2402	17	
2.5	3542	17.5	
3	2827	18	
3.5	2143	18.5	
4	1980	19	
4.5	1968	19.5	
5	1738	20	
5.5	1605	20.5	
6	1585	21	
6.5	1589	21.5	
7	1666	22	
7.5	1583	22.5	
8	1589	23	
8.5	1567	23.5	
9	1579	24	
9.5	1757	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shawan  
Operational Check 12452 cpm

Cutoff Value = 7.1 pCi/gm = calibrated for  
5,574 counts per 30 Sec. <sup>Shld, PVC was used</sup>

Boring # - 00-5-51  
(Max Depth 9 ft)  
4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	7589.	15.5	
1	4819	16	
1.5	4915	16.5	
2	5980	17	
2.5	7338	17.5	
3	9047	18	
3.5	9108	18.5	
4	7721	19	
4.5	6732	19.5	
5	5947	20	
5.5	5352	20.5	
6	5100	21	
6.5	4872	21.5	
7	4235	22	
7.5	4832	22.5	
8	3626	23	
8.5	3377	23.5	
9	3029	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01Instrument Model # Ludlum 2221Technician Toby Shewan  
Operational Check 12452 cpmSerial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

10A

Cutoff Value = 7.1 pCi/gm = Calibrated for  
5,574 counts per 30 Sec.Steel pipe,  
PVC  
used**Boring # 00.5 - 51.5**  
**(Max Depth 9 ft)**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2390	15.5	
1	2237	16	
1.5	3148	16.5	
2	5289	17	
2.5	6299	17.5	
3	6827	18	
3.5	7803	18.5	
4	9070	19	
4.5	9735	19.5	
5	8748	20	
5.5	7711	20.5	
6	6456	21	
6.5	5281	21.5	
7	4733	22	
7.5	3995	22.5	
8	3012	23	
8.5	2609	23.5	
9	2478	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01Instrument Model # Ludlum 2221Serial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Technician Toby ShewenOperational Check 12451 rpm

Cutoff Value = 7.1 pCi/gm = ~~4~~ calibrated for  
 5,574 counts per 30 Sec. Steel, PVC was  
 used

00.5 - 50.5

**Boring #** - (Max Depth 9 ft)

5"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2205	15.5	
1	2200	16	
1.5	2884	16.5	
2	4166	17	
2.5	5212	17.5	
3	4944	18	
3.5	4743	18.5	
4	4591	19	
4.5	4678	19.5	
5	4678	20	
5.5	4681	20.5	
6	4468	21	
6.5	4331	21.5	
7	4249	22	
7.5	3759	22.5	
8	3471	23	
8.5	3388	23.5	
9	3451	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01  
 Instrument Model #: Ludlum 2221  
 Serial #: 126497  
 Probe Model #: PR 44-10  
 Serial #: 171991  
 • Shielded (2")

Technician Tony Shewan  
 Operational Check 12452 cpm

Cutoff Value = 7.1 pCi/gm = calibrated for ;  
 5,574 counts per 30 Sec. Steel pipe, PVC w  
 used

00.5 - 52.5  
**Boring #** - (Max Depth 9 ft)  
 7"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3105	15.5	
1	3358	16	
1.5	2424	16.5	
2	2688	17	
2.5	3579	17.5	
3	4031	18	
3.5	4035	18.5	
4	3581	19	
4.5	3075	19.5	
5	2828	20	
5.5	3647	20.5	
6	4195	21	
6.5	4250	21.5	
7	3764	22	
7.5	3565	22.5	
8	3169	23	
8.5	4122	23.5	
9	4443	24	
9.5	4362	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 8/15/01Instrument Model #: Ludlum 2221Technician Toby SlewaneOperational Check 12452 cpmSerial # 126497Probe Model # PR 44-10Serial # 171991

Cutoff Value = 7.1 pCi/gm =  $\frac{1}{2}$  cal/hr.  
5,574 counts per 30 Sec. Steel pipe, PVC  
was used

• Shielded (2")

**Boring #00-51 (Max Depth 9' 5"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3490	15.5	
1	3918	16	
1.5	1903	16.5	
2	6083	17	
2.5	197	17.5	
3	6814	18	
3.5	6571	18.5	
4	5768	19	
4.5	4879	19.5	
5	4541	20	
5.5	4007	20.5	
6	3159	21	
6.5	2988	21.5	
7	4436	22	
7.5	5188	22.5	
8	4396	23	
8.5	3925	23.5	
9	4043	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01  
 Instrument Model #: Ludlum 2221  
 Serial #: 126497  
 Probe Model #: PR 44-10  
 Serial #: 171991  
 • Shielded (2")

Technician Toby Stewart  
 Operational Check 17452 cpm

Cutoff Value = 7.1 pCi/gm = ✓ Calibrated for  
 5,574 counts per 30 Sec. steel pipe, PVC  
 was used

NN.S-51

Boring # - (Max Depth 9 ft)  
 S"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2609	15.5	
1	3309	16	
1.5	3738	16.5	
2	4118	17	
2.5	3362	17.5	
3	3270	18	
3.5	3611	18.5	
4	3878	19	
4.5	3298	19.5	
5	2469	20	
5.5	2456	20.5	
6	2546	21	
6.5	2708	21.5	
7	2443	22	
7.5	2618	22.5	
8	2745	23	
8.5	2735	23.5	
9	3522	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

\* open hole where water line broke

Date 08/14/01

Technician \_\_\_\_\_

Instrument Model # Ludlum 2221Operational Check 12/14aSerial # 126497 unshielded 134542Probe Model # PR-44-10Serial # 171991 1521Cutoff Value = 7.1 pCi/gm =  
5,574 counts per 30 Sec.

• Shielded (2")

(in .ff

20. 576

Boring # MAG 65.5

(Max Depth ft)

MAX Count. 79,60.

cp

at

a.l.l

1' lag

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5		15.5	
1		16	
1.5		16.5	
2		17	
2.5		17.5	
3		18	
3.5		18.5	
4		19	
4.5		19.5	
5		20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

## SOUTHERN AREA DOWNHOLE GAMMA DATA

Boring Number	Location (site 5 meter gird)	Depth (feet)	Gamma Exceedance Intervals (feet below ground surface)
B-1	E-51.75	8' 11"	--
B-2	G-49.5	8' 4"	--
B-3	G.5-50.5	10' 8"	0 - 10' 8"
B-4	G.5-51.5	6' 8"	0.5 - 2.0'
B-5	F.5-51.5	9' 4"	4.5 - 6"
B-6	D.75-52.75	9' 8"	--
B-7	C.5-52.5	9' 8"	--
B-8	H.5-51.5	9' 10"	0 - 1'
B-9	F-50.5	10' 1"	--
B-4/8	J-52.5	8' 7"	--
B-5A	F.5-52	9' 5"	--
B-3A	H.5-49.75	8' 5"	--
B-8A	I.25-51.5	9' 10"	1.5 - 4.5'
B-8B	J-51.5	9' 7"	--
B-4A	G.5-52	9' 4"	4.5 - 5'
B-4B	G.5-52.75	8' 10"	--

Highlighted borings/depths exceed USEPA cleanup level.

Date: 08/08/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 11846 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated for  
5,574 counts per 30 Sec. steel pipe, PVC  
pipe was use

**Boring # B-1 (Max Depth 8 ft)**  
||"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	4759	15.5	
1	4120	16	
1.5	4086	16.5	
2	4082	17	
2.5	4141	17.5	
3	4736	18	
3.5	4838	18.5	
4	4535	19	
4.5	4627	19.5	
5	4663	20	
5.5	4688	20.5	
6	4847	21	
6.5	4937	21.5	
7	5217	22	
7.5	5074	22.5	
8	4786	23	
8.5	4790	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date 08/08/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 11846 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated to  
5,574 counts per 30 Sec. steel pipe, PVC  
pipe was used

**Boring # B-1 (Max Depth 8 ft)**  
11"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	4759	15.5	
1	4120	16	
1.5	4086	16.5	
2	4082	17	
2.5	4141	17.5	
3	4736	18	
3.5	4838	18.5	
4	4535	19	
4.5	4627	19.5	
5	4663	20	
5.5	4688	20.5	
6	4947	21	
6.5	4937	21.5	
7	5217	22	
7.5	5074	22.5	
8	4786	23	
8.5	4790	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Stewar  
Operational Check 11 846 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated  
5,574 counts per 30 Sec. steel pipe, pl  
p. pipe was u

**Boring # B -2 (Max Depth 8 ft)**  
4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3793	15.5	
1	4612	16	
1.5	4839	16.5	
2	4031	17	
2.5	3516	17.5	
3	3555	18	
3.5	3258	18.5	
4	3198	19	
4.5	3012	19.5	
5	3084	20	
5.5	3577	20.5	
6	3421	21	
6.5	3170	21.5	
7	3102	22	
7.5	3138	22.5	
8	3234	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 11,946 cpm

Cutoff Value = 7.1 pCi/gm = \*calibrated for  
5,574 counts per 30 Sec. Steel pipe, p  
ipe was u

### Boring # B-3 (Max Depth 10' ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	155,823	15.5	
1	77,417	16	
1.5	34,319	16.5	
2	14,518	17	
2.5	8,148	17.5	
3	6,571	18	
3.5	8,755	18.5	
4	16,385	19	
4.5	21,335	19.5	
5	19,800	20	
5.5	19,290	20.5	
6	13,437	21	
6.5	10,634	21.5	
7	10,581	22	
7.5	13,167	22.5	
8	13,082	23	
8.5	12,342	23.5	
9	11,817	24	
9.5	10,752	24.5	
10	10,202	25	
10.5	9,334	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01Instrument Model # Ludlum 2221Serial # 126497Probe Model # PR 44-10Serial # 171991

• Shielded (2")

Technician Toby Shewan  
Operational Check 11846 cpmCutoff Value = 7.1 pCi/gm = \* calibrated  
5,574 counts per 30 Sec. steel pipe, p  
pipe was l**Boring # B - 4 (Max Depth 6 ft)**  
8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	10,972	15.5	
1	22871	16	
1.5	58,479	16.5	
2	15,760	17	
2.5	6343	17.5	
3	3689	18	
3.5	3110	18.5	
4	3086	19	
4.5	3051	19.5	
5	2876	20	
5.5	2688	20.5	
6	2865	21	
6.5	3689	21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Stewart  
Operational Check 11846 cpm

Cutoff Value =  $7.1 \text{ pCi/gm}$  \* calibrated  
5,574 counts per 30 Sec. steel pipe,  
PVC pipe used

**Boring # B - 5 (Max Depth 9 ft)**  
**4"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3006	15.5	
1	3633	16	
1.5	3138	16.5	
2	2122	17	
2.5	1745	17.5	
3	1681	18	
3.5	2416	18.5	
4	3351	19	
4.5	3851	19.5	
5	5638	20	
5.5	16,468	20.5	
6	7818	21	
6.5	4254	21.5	
7	3166	22	
7.5	3308	22.5	
8	3814	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

\* pipe obstructed at 8.5'

Date: 08/08/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 11846 cpm

Cutoff Value = 7.1 pCi/gm = calibrated for  
5,574 counts per 30 Sec. Steel pipe, Pl  
p.ipe was u

**Boring # B-6 (Max Depth 9 ft)**  
8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2723	15.5	
1	2922	16	
1.5	3399	16.5	
2	4154	17	
2.5	4179	17.5	
3	4298	18	
3.5	4385	18.5	
4	4721	19	
4.5	4624	19.5	
5	4415	20	
5.5	4237	20.5	
6	4265	21	
6.5	4219	21.5	
7	3903	22	
7.5	2902	22.5	
8	3526	23	
8.5	4010	23.5	
9	3740	24	
9.5	3862	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/10/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Stewen  
Operational Check 11846 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated for  
5,574 counts per 30 Sec. Pipe - PVC pipe  
was used

**Boring # B - 7 (Max Depth 9 ft)**  
**8"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2672	15.5	
1	2575	16	
1.5	2309	16.5	
2	2930	17	
2.5	3600	17.5	
3	3550	18	
3.5	2652	18.5	
4	2007	19	
4.5	1727	19.5	
5	1675	20	
5.5	1952	20.5	
6	2286	21	
6.5	3432	21.5	
7	3431	22	
7.5	3794	22.5	
8	4314	23	
8.5	4157	23.5	
9	3604	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

\* bottom of pipe was obstructed so no reading for 9.5'

Date: 08/09/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm = calibrated for  
5,574 counts per 30 Sec. steel pipe, 1  
pipe was us

**Boring # B-8 (Max Depth 9 ft)**  
*10"*

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	14220	15.5	
1	6229	16	
1.5	4812	16.5	
2	4125	17	
2.5	3192	17.5	
3	3642	18	
3.5	3414	18.5	
4	2830	19	
4.5	2935	19.5	
5	2712	20	
5.5	2346	20.5	
6	2922	21	
6.5	3084	21.5	
7	3442	22	
7.5	3502	22.5	
8	3562	23	
8.5	3684	23.5	
9	3528	24	
9.5	3496	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991

• Shielded (2")

Technician Tob, Shuan  
Operational Check 12,115 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated to  
5,574 counts per 30 Sec. Steel pipe, PV  
used

### Boring # B - 9 (Max Depth 10 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3763	15.5	
1	4261	16	
1.5	4533	16.5	
2	4557	17	
2.5	4365	17.5	
3	4136	18	
3.5	3436	18.5	
4	2896	19	
4.5	2812	19.5	
5	2641	20	
5.5	2551	20.5	
6	2561	21	
6.5	2744	21.5	
7	3394	22	
7.5	3543	22.5	
8	3552	23	
8.5	3609	23.5	
9	3565	24	
9.5	3584	24.5	
10	3779	25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm = \* calibrated for  
5,574 counts per 30 Sec. steel pipe, PVC  
was used

**Boring #B -5A (Max Depth 9' ft)  
5"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2721	15.5	
1	3177	16	
1.5	3061	16.5	
2	2950	17	
2.5	2616	17.5	
3	2445	18	
3.5	2407	18.5	
4	2603	19	
4.5	3042	19.5	
5	3267	20	
5.5	3123	20.5	
6	2724	21	
6.5	2855	21.5	
7	2925	22	
7.5	2916	22.5	
8	2909	23	
8.5	3041	23.5	
9	3436	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12/15

Cutoff Value = 7.1 pCi/gm = ✓ Calibrated  
5,574 counts per 30 Sec. Steel pipe. Pipe was vs

**Boring #B -3A (Max Depth 8 ft)**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3023	15.5	
1	3380	16	
1.5	3930	16.5	
2	4217	17	
2.5	4651	17.5	
3	3947	18	
3.5	3162	18.5	
4	3198	19	
4.5	3214	19.5	
5	3425	20	
5.5	3708	20.5	
6	3485	21	
6.5	3140	21.5	
7	3355	22	
7.5	3655	22.5	
8	3990	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12/15 rpm

Cutoff Value = 7.1 pCi/gm = calibrated to  
5,574 counts per 30 Sec. Steel pipe, PVC  
pipe was used.

**Boring #B -8A (Max Depth 9 ft)  
10"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3058	15.5	
1	3649	16	
1.5	4777	16.5	
2	9583	17	
2.5	34,840	17.5	
3	36,855	18	
3.5	17,622	18.5	
4	10,438	19	
4.5	5959	19.5	
5	3400	20	
5.5	2842	20.5	
6	3002	21	
6.5	2945	21.5	
7	2964	22	
7.5	3258	22.5	
8	3395	23	
8.5	3599	23.5	
9	3538	24	
9.5	3384	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date 08/09/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Steven  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm => calibrated for  
5,574 counts per 30 Sec. Steel pipe, PV  
was used

**Boring # B -4A (Max Depth 9 ft)**  
**4"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2715	15.5	
1	2885	16	
1.5	2472	16.5	
2	2616	17	
2.5	2717	17.5	
3	3330	18	
3.5	3945	18.5	
4	4144	19	
4.5	4989	19.5	
5	5874	20	
5.5	5305	20.5	
6	4442	21	
6.5	3458	21.5	
7	3474	22	
7.5	3339	22.5	
8	3298	23	
8.5	3386	23.5	
9	3444	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model # Ludlum 2221  
Serial # 126497  
Probe Model # PR 44-10  
Serial # 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm  $\Rightarrow$  Calibrated for  
5,574 counts per 30 Sec. Steel pipe, PVC  
pipe was used

**Boring #B -8B (Max Depth 9' ft)  
7"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2264	15.5	
1	2197	16	
1.5	2852	16.5	
2	3366	17	
2.5	4723	17.5	
3	5468	18	
3.5	5165	18.5	
4	4060	19	
4.5	4393	19.5	
5	4376	20	
5.5	4378	20.5	
6	3706	21	
6.5	3751	21.5	
7	4193	22	
7.5	4084	22.5	
8	3597	23	
8.5	3676	23.5	
9	3646	24	
9.5	3378	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

\*Technician Toby Shewan  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm = ~~#~~ calibrated  
5,574 counts per 30 Sec. Steel pipe, #  
pipe was use

**Boring # B -4B (Max Depth 8 ft)  
10"**

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2791	15.5	
1	3467	16	
1.5	3582	16.5	
2	3383	17	
2.5	3109	17.5	
3	3073	18	
3.5	2734	18.5	
4	2579	19	
4.5	2658	19.5	
5	2454	20	
5.5	2364	20.5	
6	2404	21	
6.5	2654	21.5	
7	2835	22	
7.5	3195	22.5	
8	3417	23	
8.5	3377	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01  
Instrument Model #: Ludlum 2221  
Serial #: 126497  
Probe Model #: PR 44-10  
Serial #: 171991  
• Shielded (2")

Technician Toby Shewan  
Operational Check 12115 cpm

Cutoff Value = 7.1 pCi/gm = ~~✓~~ calibrated for  
5,574 counts per 30 Sec. Steel pipe, 1/2" pipe was used

**Boring #8 - 4/8 (Max Depth 8 ft)**  
7"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2554	15.5	
1	2785	16	
1.5	2583	16.5	
2	2868 <del>2660</del>	17	
2.5	3635	17.5	
3	3088	18	
3.5	3372	18.5	
4	3605	19	
4.5	3474	19.5	
5	3292	20	
5.5	3580	20.5	
6	3652	21	
6.5	3915	21.5	
7	3869	22	
7.5	3227	22.5	
8	2761	23	
8.5	2750	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	



**Stan A. Huber Consultants, Inc.**  
**Health Physics and Radiation Safety Services**

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## Fax Transmission Cover Sheet

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08/10/01

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Toby Shewan (Stan A. Huber Consultants Inc.)

Number of Pages

(Including Cover Sheet) 17

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Down hole data from Lake Shore East

for 08/08/01 and 08/09/01.

**APPENDIX C**

**GAMMA SPEC LABORATORY ANALYSIS**

## NORTHERN AREA LABORATORY ANALYSIS

Boring Number	Location	Sample Depth (feet)	PB-214 <sup>1</sup> pCi/g	Ac-228 <sup>2</sup> pCi/g	Total Radium <sup>3</sup> pCi/g
12	MM-66	1	1.42	12.6	14.02
12-A	MM-66.25	1	1.80	6.71	8.51
13	PP.5-66.5	1	0.66	0.46	1.12
13-B	OO.5-67	1	0.42	0.36	0.78
14	PP-62.5	1	0.72	0.38	1.10
15	SS.5-58.25	1	0.43	0.23	0.66
16	LL-59	1	0.76	0.55	1.31
18	SS-50.5	1	0.22	0.19	0.41
18	SS-50.5	7	0.37	0.35	0.72
18-A	SS.5-51.5 *	1	0.36	0.31	0.67
18-B	SS.5-50 *	2-3	0.32	0.34	0.66
19	OO.5-51	1	2.98	1.09	4.07
19-A	OO.5-51.5	1	1.55	0.92	2.47
19-A	OO.5-51.5	7	2.14	0.86	3.00
19-B	PP-51	1	0.65	0.57	1.22
19-C	OO.5-50.5	1.5	0.99	0.68	1.67
19-D	OO.5-52.5	1	0.98	0.71	1.69
19-E	OO-51	2	1.19	1.05	2.24
19-F	NN.5-51	1	0.86	0.50	1.36
Grab	PP-59	1	1.03	0.69	1.72

Borings 13-A and 17 were not sampled.

- Borings 18-A and 18-B were listed at TT-5 on chain of custody.

Highlighted samples exceed USEPA cleanup level.

1 Pb-224 is surrogate for Ra-226

2 Ac-228 is surrogate for Ra-228

3 Total Radium is Rz-226 plus Ra-228

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012896 STS LAKE SHORE EAST PP-62.5

Sample Size . . . . .	1.28e+003 g	Spectrum File . . . H:\PCASPEC\012896.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF]. . . . . 0.00e+000 Hrs

Eff. =  $1/[7.31e-002 * En^2 - 2.40e+000 + 7.89e+001 * En^8.95e-001]$  02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	4.90e-007 +-1.29e-007	2.74e+002	1 of 7
U-235	Average:	9.40e-008 +-1.59e-008	6.17e+012	2 of 7
	93.35	1.23e-006 +-3.23e-007		
	185.72	9.12e-008 +-1.59e-008		
Th-234	Average:	2.03e-006 +-3.77e-007	5.78e+002	2 of 3
	92.38	2.01e-006 +-5.29e-007		
	92.80	2.04e-006 +-5.36e-007		
Pb-212	Average:	3.79e-007 +-2.04e-008	1.06e+001	2 of 5
	77.11	3.78e-007 +-1.13e-007		
	238.63	3.79e-007 +-2.08e-008		
Pb-214	Average:	7.19e-007 +-2.38e-008	4.47e-001	3 of 6
	241.98	9.90e-007 +-1.07e-007		
	295.21	7.04e-007 +-4.81e-008		
	351.92	7.05e-007 +-2.83e-008		
Tl-208	Average:	1.30e-007 +-1.12e-008	5.09e-002	2 of 5
	510.84	1.39e-007 +-4.21e-008		
	583.14	1.30e-007 +-1.16e-008		
Pa-234	94.66	3.49e-007 +-9.18e-008	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	3.85e-007 +-3.37e-008	6.13e+000	3 of 10
	338.32	4.23e-007 +-7.29e-008		
	911.07	4.06e-007 +-4.44e-008		
	969.11	2.90e-007 +-7.32e-008		
Ra-224	240.98	1.88e-006 +-2.02e-007	8.69e+001	1 of 1
Tl-210	298.00	1.71e-007 +-1.17e-008	2.17e-002	1 of 3
Bi-211	351.07	2.03e-006 +-8.14e-008	3.55e-002	1 of 1
Bi-214	Average:	7.06e-007 +-2.63e-008	3.32e-001	3 of 7

	609.31	6.77e-007	--2.89e-008		
	1120.30	7.27e-007	--9.79e-008		
	1764.50	9.27e-007	--8.33e-008		
K-40	1460.90	1.14e-005	--3.09e-007	1.12e-013	1 of 1
TOTAL:		2.08e-005	uCi/g		

---

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR C Nuclide Activity Summary

Sample ID: 012897 STS LAKE SHORE EAST MM-66.25

Sample Size . . . . .	8.86e+002 g	Spectrum File . . . H:\PCASPEC\012897.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	Average:	1.05e-006 +-1.16e-007	2.74e+002	2 of 7
	83.78	7.16e-007 +-1.26e-007		
	94.90	2.90e-006 +-2.99e-007		
U-235	Average:	2.91e-007 +-3.70e-008	6.17e+012	3 of 7
	89.95	1.40e-005 +-8.85e-007		
	93.35	7.30e-006 +-7.51e-007		
	185.72	2.50e-007 +-3.71e-008		
Th-234	Average:	1.20e-005 +-8.74e-007	5.78e+002	2 of 3
	92.38	1.19e-005 +-1.23e-006		
	92.80	1.21e-005 +-1.24e-006		
Pb-212	Average:	6.62e-006 +-6.96e-008	1.06e+001	5 of 5
	74.82	6.65e-006 +-3.79e-007		
	77.11	6.65e-006 +-2.57e-007		
	87.30	6.65e-006 +-4.05e-007		
	238.63	6.65e-006 +-7.55e-008		
	300.09	4.46e-006 +-6.00e-007		
Pb-214	Average:	1.80e-006 +-4.84e-008	4.47e-001	4 of 6
	74.82	2.05e-006 +-6.52e-007		
	241.98	5.45e-006 +-1.95e-007		
	295.21	1.51e-006 +-1.08e-007		
	351.92	1.56e-006 +-5.67e-008		
Tl-208	Average:	2.21e-006 +-3.72e-008	5.09e-002	5 of 5
	74.97	2.16e-006 +-1.18e-006		
	277.35	2.08e-006 +-2.78e-007		
	510.84	2.46e-006 +-1.13e-007		
	583.14	2.17e-006 +-4.08e-008		
	660.37	2.63e-006 +-1.93e-007		

Zn-231	84.21	2.75e-006	--4.82e-007	2.55e+001	1 of 1
Ta-228	84.37	1.46e-006	--2.57e-006	1.68e+004	1 of 2
Au-194	Average:	6.17e-007	--1.03e-007	6.70e+000	2 of 14
	94.66	6.16e-007	--2.13e-007		
	131.20	6.17e-007	--1.18e-007		
Ra-226	186.10		I.B. Only	1.40e-007	1 of 1
Ac-228	Average:	6.71e-006	--9.40e-008	6.13e+000	10 of 10
	209.26	5.58e-006	--5.30e-007		
	273.23	6.13e-006	--5.23e-007		
	327.64	6.28e-006	--6.13e-007		
	338.32	6.44e-006	--2.16e-007		
	409.51	6.24e-006	--8.64e-007		
	463.00	6.45e-006	--4.92e-007		
	794.70	5.06e-006	--5.19e-007		
	911.07	7.00e-006	--1.48e-007		
	964.60	6.45e-006	--4.73e-007		
	969.11	7.11e-006	--2.12e-007		
Ra-224	140.98	1.03e-005	--3.69e-007	8.69e+001	1 of 1
Zr-210	198.00	3.67e-007	--2.62e-008	2.17e+002	1 of 3
Ei-212	727.17	4.30e-006	--2.27e-007	1.01e+000	1 of 2
Ei-211	361.07	4.50e-006	--1.63e-007	3.55e+002	1 of 1
Ei-214	Average:	1.55e-006	--5.33e-008	3.32e+001	3 of 3
	619.31	1.49e-006	--5.95e-008		
	1110.30	1.59e-006	--1.71e-007		
	1764.60	1.96e-006	--1.68e-007		
X-40	1460.80	1.18e-005	--4.13e-007	1.12e+013	1 of 1
TOTAL:		8.15e-006	uCi/g		

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
635.58	3434.21	151	35	69	260	1.32	2.822e-000
1587.26	4517.02	165	30	56	161	2.15	5.467e-000
1619.50	6649.48	117	24	46	77	2.02	4.284e-000
1629.91	6691.77	156	19	31	35	1.30	5.293e-000

## RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR C Nuclide Activity Summary

Sample ID: 012898 STS LAKE SHORE EAST MM-66

Sample Size . . . . . 9.29e+002 g | Spectrum File . . H:\PCASPEC\012898.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-16-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	Average:	1.74e-006 +-1.14e-007	2.74e+002	4 of 7
	83.78	1.41e-006 +-1.68e-007		
	94.90	2.02e-006 +-3.82e-007		
	154.21	2.02e-006 +-4.92e-007		
	269.46	2.02e-006 +-1.82e-007		
U-235	Average:	3.61e-007 +-5.22e-008	6.17e+012	3 of 7
	89.95	2.16e-005 +-1.17e-006		
	93.35	3.22e-006 +-9.60e-007		
	185.72	3.11e-007 +-5.24e-008		
Th-234	Average:	5.30e-006 +-1.12e-006	5.78e+002	2 of 3
	92.38	5.27e-006 +-1.57e-006		
	92.80	5.34e-006 +-1.59e-006		
Pb-212	Average:	1.27e-005 +-9.35e-008	1.06e+001	5 of 5
	74.82	1.28e-005 +-5.22e-007		
	77.11	1.24e-005 +-3.66e-007		
	87.30	1.21e-005 +-5.41e-007		
	238.63	1.28e-005 +-1.01e-007		
	300.09	1.03e-005 +-7.69e-007		
Pb-214	Average:	1.42e-006 +-6.02e-008	4.47e-001	5 of 6
	74.82	1.42e-006 +-8.98e-007		
	77.11	1.42e-006 +-6.30e-007		
	241.98	1.42e-006 +-2.57e-007		
	295.21	1.42e-006 +-1.39e-007		
	351.92	1.42e-006 +-6.97e-008		
Zn-208	Average:	4.36e-006 +-5.05e-008	5.09e-002	5 of 5
	74.97	4.31e-006 +-1.63e-006		
	277.35	3.75e-006 +-3.42e-007		

	510.84	4.72e-006	--1.56e-007					
	583.14	4.31e-006	--5.53e-008					
	860.37	4.80e-006	--2.48e-007					
$\beta\text{-}234$	Average:	1.45e-006	--1.41e-007	6.70e-000	2 of 14			
	94.66	1.45e-006	--2.73e-007					
	131.20	1.45e-006	--1.65e-007					
$\beta\text{-}226$	186.10		I.B.Only	1.40e+007	1 of 1			
$\beta\text{-}228$	Average:	1.26e-005	--1.21e-007	6.13e+000	10 of 10			
	209.28	1.39e-005	--6.73e-007					
	270.23	4.30e-006	--6.89e-007					
	327.64	1.36e-005	--7.40e-007					
	338.32	1.15e-005	--2.63e-007					
	409.51	1.12e-005	--1.16e-006					
	463.00	1.18e-005	--6.00e-007					
	794.70	1.13e-005	--6.79e-007					
	911.37	1.31e-005	--1.97e-007					
	964.60	1.32e-005	--6.08e-007					
	969.11	1.38e-005	--2.76e-007					
$\beta\text{-}214$	240.98	1.57e-005	--4.88e-007	8.69e+001	1 of 1			
$\beta\text{-}212$	727.17	7.63e-006	--3.17e-007	1.01e+000	1 of 2			
$\beta\text{-}211$	351.07	5.80e-007	--2.81e-007	3.55e+002	1 of 1			
$\beta\text{-}214$	Average:	1.61e-006	--6.30e-008	3.32e+001	3 of 1			
	609.31	1.48e-006	--7.03e-008					
	1120.30	1.88e-006	--1.98e-007					
	1764.50	2.17e-006	--2.03e-007					
$\gamma\text{-}40$	1460.80	1.05e-005	--4.20e-007	1.12e+013	1 of 1			
TOTAL:		7.62e-005	dc1/g					

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
770.11	3173.78	367	66	107	576	1.60	6.393e+000
786.13	3207.10	232	60	99	543	1.51	4.102e+000
835.10	3432.06	367	60	97	469	1.89	6.854e+000
1494.53	6137.16	181	30	58	143	2.12	4.741e+000
1586.79	6515.09	486	35	86	164	2.27	1.507e+001
1591.11	6532.79	180	37	55	191	2.39	9.363e+000
1619.46	6649.00	181	34	65	180	1.94	6.106e+000
1629.39	6659.64	246	36	67	169	1.45	8.344e+000

RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR C Nuclide Activity Summary

Sample ID: 012899 STS LAKE SHORE EAST LL-59

Sample Size . . . . .	9.95e+002 g	Spectrum File . . . H:\PCASPEC\012899.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.14e-007 +-2.07e-008	6.17e+012	1 of 7
Pb-212	Average:	4.68e-007 +-2.59e-008	1.06e+001	2 of 5
	77.11	4.28e-007 +-1.41e-007		
	238.63	4.69e-007 +-2.63e-008		
Pb-214	Average:	7.56e-007 +-2.83e-008	4.47e-001	3 of 6
	241.98	7.12e-007 +-1.21e-007		
	295.21	8.19e-007 +-5.64e-008		
	351.92	7.37e-007 +-3.39e-008		
Tl-208	Average:	1.55e-007 +-1.36e-008	5.09e-002	2 of 5
	510.84	2.17e-007 +-5.19e-008		
	583.14	1.50e-007 +-1.41e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.54e-007 +-4.52e-008	6.13e+000	2 of 10
	338.32	4.45e-007 +-8.59e-008		
	911.07	5.96e-007 +-5.31e-008		
Ra-224	240.98	1.35e-006 +-2.30e-007	8.69e+001	1 of 1
Tl-210	298.00	1.99e-007 +-1.37e-008	2.17e-002	1 of 3
Bi-211	351.07	2.12e-006 +-9.76e-008	3.55e-002	1 of 1
Bi-214	Average:	7.61e-007 +-3.15e-008	3.32e-001	3 of 7
	609.31	7.16e-007 +-3.47e-008		
	1120.30	8.79e-007 +-1.20e-007		
	1764.50	1.04e-006 +-9.65e-008		
K-40	1460.80	1.10e-005 +-3.32e-007	1.12e+013	1 of 1
TOTAL:		1.75e-005 uCi/g		

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR\_C Nuclide Activity Summary

Sample ID: 012900 STS LAKE SHORE EAST PP.5-66.5

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Sample Size . . . . . 7.5le-302 g | Spectrum File . . H:\PCASPEC\312900.SPM
Sampling Start. . . . . 08-30-00 00:00 | Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . . 08-30-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . . 08-30-00 00:00 | Decay Time [OFF]. . . . . 0.00e-000 Hrs

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Eff. = 1.17.31e-002 \* En^1 - 2.43e-003 + 7.89e-001 \* En^6. 95e-001) 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 & : Decay Limit <= . . . 8.000 Halflives  
Library Energy Tolerance. . . 1.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy keV	Cond -- 1.00sigma uci/g	Halflife 'hrs.'	Peaks Found
$\text{K-40}$	165.70	1.04e-007	--2.21e-008	6.17e-012
$\text{Ar-41}$	138.63	3.06e-007	--3.31e-008	1.06e-001
$\text{Ar-41}$	Average:	6.38e-007	--3.28e-008	4.47e-001
	195.21	6.36e-007	--6.52e-008	
	351.92	6.45e-007	--3.79e-008	
$\text{K-40}$	563.14	1.37e-007	--1.61e-008	5.09e-002
$\text{Ar-41}$	166.10		--1.0. Only	1.40e-007
$\text{Ar-41}$	Average:	4.65e-007	--4.43e-008	6.13e-000
	338.32	4.27e-007	--9.87e-008	
	911.07	4.48e-007	--5.76e-008	
	969.11	6.43e-007	--9.78e-008	
$\text{Ba-134}$	240.98	3.69e-006	--3.74e-007	8.69e-001
$\text{Ba-134}$	298.00	1.69e-007	--1.59e-008	2.17e-002
$\text{Ba-134}$	351.07	1.66e-006	--1.09e-007	3.55e-002
$\text{Ba-134}$	Average:	6.33e-007	--3.44e-008	3.32e-001
	609.31	6.08e-007	--3.71e-008	
	1120.30	5.82e-007	--1.40e-007	
	1764.50	9.43e-007	--1.20e-007	
$\text{K-40}$	1460.80	1.04e-006	--3.71e-007	1.12e-013
TOTAL:		1.05e-006	uci/g	

## UNKNOWN PEAKS

Energy	Dentroic cell	Centroid Channel	Net Counts	Un- Certainty	C.L.	Sig. Counts	FWHM (keV)	Net Gamma/Ised
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None





RSSI: High Resolution Gamma Spectroscopy Analysis

## Quantum Technology SDR C Nuclide Activity Summary

Sample 12: 2:2303 STA LAKE SHORE EAST SS-50.5 (1')

Sample Site . . . . . 1.34e-003 g : Spectrum File . . . H:\PCASPEC\Cl2903.SPM  
Sampling Start. . . . . 08-08-00 00:00 : Counting Start. . . . . 08-16-01 00:00  
Sampling Stop . . . . . 08-08-00 00:00 : Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-08-00 00:00 : Decay Time [OFF]. . . . . 0.00e-000 Hrs

~~eff.= 1.17.31e-002\*En^2.40e-003 + -7.89e-001\*En^0.95e-001}~~ 02-01-01 12:00

**FINAL ACTIVITY REPORT**

Nuclide	Energy keV	Conn -- 1.00sigma	Halflife hrs	Peaks Found	
<del>Zr-90</del>	108.63	1.17e-007	-1.81e-018	1 of 5	
<del>Zr-94</del>	Average:	2.16e-007	-1.64e-018	4.47e-001	1 of 6
	195.21	2.91e-007	-3.40e-008		
	381.92	1.93e-007	-1.67e-008		
<del>Zr-98</del>	583.14	6.12e-008	-8.83e-009	5.09e-002	1 of 5
<del>Zr-100</del>	911.07	1.91e-007	-3.29e-008	6.13e-000	1 of 10
<del>Zr-104</del>	140.98	1.32e-006	-2.04e-017	8.69e-001	1 of 1
<del>Zr-110</del>	198.00	7.08e-008	-8.26e-009	2.17e-002	1 of 3
<del>Zr-111</del>	381.07	5.66e-007	-5.39e-008	3.55e-002	1 of 1
<del>Zr-114</del>	609.31	2.27e-007	-1.79e-008	3.32e-001	1 of 1
<del>Rb-40</del>	1460.80	9.17e-006	-2.60e-007	1.12e-013	1 of 1
TOTAL:		1.13e-005	0.01's		

## UNIVERSITY PEAKS

Energy	Centroid	Net	Un-	C.L.	Bkg.	FWHM	Net
keV	Channel	Counts	Certainty	Counts	Counts	(keV)	Gamma/sec
=====							
None							







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RSSI High Resolution Gamma Spectroscopy Analysis  
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Quantum Technology  
GDR\_C Nuclide Activity Summary  
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Sample ID: C12907 STS LAKE SHORE EAST CO.5-51 |

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Sample Size . . . . . 7.68e-002 g Spectrum File . . . H:\PCASPEC\12907.SPM  
 Sampling Start. . . . . 08-00-01 00:00 Counting Start. . . . . 08-16-01 00:00  
 Sampling Stop . . . . . 08-00-00 00:00 Buildup Time. . . . . 0.00e+000 Hrs  
 Current Date. . . . . 08-00-01 00:00 Decay Time [OFF]. . . . . 0.00e+000 Hrs

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Efficiency File.H:\GDR.EFF 60CMAR.EFF Library File. . . H:\GDR\LIB\UTHACK.LIB  
 Is. . . . . 500 ml Marinelli IS. . . U, Th, & Ac Natural Series + K

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Eff.= 1.17.31e-002\*En^1.41e-000 - 7.89e+001\*En^8.95e-001] 02-01-01 12:00

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Gamma Fraction Limit >= . . . 10.00 % Decay Limit <= . . . 8.000 Halflives  
 Dictionary Energy Tolerance. . . 1.50

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FINAL ACTIVITY REPORT

Nuclide	Energy keV	Sens -- 1.00sigma dCl/g	Halflife (hrs)	Peaks Found
<sup>238</sup> U	94.90	1.03e-006 --0.51e-007	2.74e-002	1 cf 7
A-136	Average:	3.74e-007 --3.11e-008	6.17e-012	2 cf 7
	93.35	3.06e-006 --6.31e-007		
	185.72	3.67e-007 --3.19e-008		
<sup>238</sup> Ra	Average:	5.07e-006 --7.34e-007	5.78e-002	2 cf 3
	92.38	5.04e-006 --1.03e-006		
	92.80	5.11e-006 --1.04e-006		
<sup>238</sup> Po	Average:	1.03e-006 --4.27e-008	1.06e-001	4 cf 5
	74.82	1.03e-006 --2.65e-007		
	77.11	1.03e-006 --1.89e-007		
	97.30	1.03e-006 --3.73e-007		
	238.63	1.03e-006 --4.48e-008		
<sup>234</sup> Pa	Average:	2.98e-006 --5.19e-008	4.47e-001	5 cf 6
	74.82	1.75e-006 --4.57e-007		
	77.11	2.00e-006 --3.25e-007		
	241.98	3.73e-006 --2.05e-007		
	295.21	3.00e-006 --1.04e-007		
	351.92	2.93e-006 --6.43e-008		
<sup>234</sup> Tl	Average:	3.18e-007 --2.20e-008	5.09e-002	3 cf 5
	74.97	3.09e-007 --8.27e-007		
	510.94	4.13e-007 --8.55e-008		
	583.14	3.11e-007 --2.28e-008		
<sup>234</sup> Ra	94.66	8.74e-007 --1.79e-007	6.70e-000	1 cf 14
<sup>234</sup> Ac	186.10		1.0.Only 1.40e+007	1 cf 1
<sup>228</sup> Ac	Average:	1.09e-006 --6.55e-008	6.13e-000	3 cf 10
	338.32	1.17e-006 --1.44e-007		
	911.07	1.19e-006 --9.01e-008		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

	969.11	9.07e-007	--1.28e-007				
<del>Pa-224</del>	240.96	1.07e-006	--3.88e-007	8.69e-001	1 of 1		
<del>Tl-200</del>	298.00	1.30e-007	--2.53e-008	2.17e-002	1 of 1		
<del>Bi-211</del>	351.07	8.43e-006	--1.85e-007	3.55e-002	1 of 1		
<del>Bi-214</del>	Average:	2.93e-006	--5.87e-008	3.32e-001	6 of 6		
	609.31	2.84e-006	--6.55e-008				
	768.36	2.70e-006	--4.16e-007				
	934.06	2.94e-006	--6.01e-007				
	1120.30	3.18e-006	--2.06e-007				
	1238.10	3.60e-006	--3.98e-007				
	1764.50	3.84e-006	--2.29e-007				
E-40	1460.80	9.03e-006	--3.71e-007	1.12e-013	1 of 1		
TOTAL:		4.11e-005	uCi/g				

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#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
=====							
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012908 STS LAKE SHORE EAST 00.5-51.5 (7'

Sample Size . . . . . 6.58e+002 g | Spectrum File . . H:\PCASPEC\012908.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-16-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % ! Decay Limit <=. . . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.02e-006 +-2.36e-007	2.74e+002	1 of 7
U-235	Average:	2.84e-007 +-3.19e-008	6.17e+012	2 of 7
	93.35	2.57e-006 +-5.93e-007		
	185.72	2.77e-007 +-3.20e-008		
Th-234	Average:	4.24e-006 +-6.91e-007	5.78e+002	2 of 3
	92.38	4.21e-006 +-9.71e-007		
	92.80	4.27e-006 +-9.84e-007		
Pb-212	Average:	8.55e-007 +-4.09e-008	1.06e+001	3 of 5
	74.82	8.57e-007 +-3.08e-007		
	77.11	8.55e-007 +-1.82e-007		
	238.63	8.55e-007 +-4.24e-008		
Pb-214	Average:	2.14e-006 +-4.99e-008	4.47e-001	5 of 6
	74.82	2.36e-006 +-5.30e-007		
	77.11	1.98e-006 +-3.14e-007		
	241.98	2.20e-006 +-2.04e-007		
	295.21	2.20e-006 +-9.85e-008		
	351.92	2.12e-006 +-6.20e-008		
Tl-208	Average:	2.75e-007 +-2.54e-008	5.09e-002	3 of 5
	74.97	2.59e-007 +-9.60e-007		
	510.84	3.95e-007 +-8.27e-008		
	583.14	2.63e-007 +-2.67e-008		
Pa-234	94.66	7.31e-007 +-1.68e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.65e-007 +-6.10e-008	6.13e+000	3 of 10
	338.32	9.50e-007 +-1.46e-007		
	911.07	8.26e-007 +-8.20e-008		
	969.11	8.90e-007 +-1.17e-007		

$\lambda_{\text{Fe-224}}$	240.98	4.17e-006	--3.87e-007	8.69e+001	1.05	1
$\lambda_{\text{Ti-244}}$	293.00	5.35e-007	--2.39e-008	2.17e+002	1.05	3
$\lambda_{\text{Si-201}}$	351.07	6.09e-006	--1.78e-007	3.65e+002	1.05	1
$\lambda_{\text{Si-214}}$	Average:	2.05e-006	--5.54e-008	3.32e+001	5.05	1
	609.31	1.96e-006	--6.33e-008			
	768.36	1.96e-006	--4.17e-007			
	1120.30	2.04e-006	--1.79e-007			
	1238.10	2.99e-006	--4.70e-007			
	1764.50	2.55e-006	--1.68e-007			
X-40	1460.80	7.56e-006	--4.03e-007	1.12e+013	1.05	1
TOTAL:		3.08e-005	0.01/g			

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#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM 'keV'	Net Gamma 'sec
=====							
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR\_C Nuclide Activity Summary

Sample ID: 012909 STS LAKE SHORE EAST 00.5-51.5 (1.

Sample Size . . . . .	6.50e+002 g	Spectrum File . . . H:\PCASPEC\012909.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	8.15e-007 +-2.34e-007	2.74e+002	1 of 7
K-235	Average:	2.54e-007 +-3.18e-008	6.17e+012	2 of 7
	93.35	2.05e-006 +-5.88e-007		
	185.72	2.48e-007 +-3.19e-008		
Th-234	Average:	3.37e-006 +-6.85e-007	5.78e+002	2 of 3
	92.38	3.35e-006 +-9.62e-007		
	92.80	3.40e-006 +-9.75e-007		
Pb-212	Average:	9.17e-007 +-4.40e-008	1.06e+001	3 of 5
	74.82	9.17e-007 +-2.55e-007		
	77.11	9.16e-007 +-1.89e-007		
	238.63	9.17e-007 +-4.59e-008		
Pb-214	Average:	1.55e-006 +-4.35e-008	4.47e-001	5 of 6
	74.82	1.86e-006 +-4.40e-007		
	77.11	1.45e-006 +-3.25e-007		
	241.98	1.51e-006 +-1.70e-007		
	295.21	1.57e-006 +-8.75e-008		
	351.92	1.55e-006 +-5.35e-008		
Tl-208	Average:	2.78e-007 +-2.20e-008	5.09e-002	3 of 5
	74.97	2.76e-007 +-7.96e-007		
	510.84	2.52e-007 +-7.78e-008		
	583.14	2.80e-007 +-2.30e-008		
Pa-234	94.66	5.81e-007 +-1.67e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.25e-007 +-6.11e-008	6.13e+000	3 of 10
	338.32	7.52e-007 +-1.42e-007		
	911.07	9.97e-007 +-7.90e-008		
	969.11	8.75e-007 +-1.32e-007		

$\text{Ra-224}$	240.98	$2.87\text{e-}006$	$--3.23\text{e-}007$	$8.69\text{e+}001$	1 of 1	
$\text{Zr-90}$	298.00	$3.81\text{e-}007$	$--2.13\text{e-}008$	$2.17\text{e-}002$	1 of 3	
$\text{Pb-210}$	351.07	$4.45\text{e-}006$	$--1.54\text{e-}007$	$3.55\text{e-}002$	1 of 1	
$\text{Bi-214}$	Average:	$1.30\text{e-}006$	$--4.88\text{e-}008$	$3.32\text{e-}001$	3 of 7	
	609.31	$1.25\text{e-}006$	$--5.31\text{e-}008$			
	1120.30	$1.46\text{e-}006$	$--1.64\text{e-}007$			
	1764.50	$1.62\text{e-}006$	$--1.91\text{e-}007$			
$\text{K-40}$	1460.90	$9.54\text{e-}006$	$--4.23\text{e-}007$	$1.12\text{e-}013$	1 of 1	
TOTAL:		$2.72\text{e-}005$	$\mu\text{Ci/g}$			

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#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- certainty Counts	C.L. Counts	Bkg. Counts	FWHM keV	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR\_C Nuclide Activity Summary

Sample ID: 012910 STS LAKE SHORE EAST PP-51

Sample Size . . . . .	7.95e+002 g	Spectrum File . . . H:\PCASPEC\012910.SPM
Sampling Start . . . . .	00-00-00 00:00	Counting Start . . . . . 08-16-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time . . . . . 0.00e+000 Hrs
Current Date . . . . .	00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff. = 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife ) (hrs)	Peaks Found
Pb-212	238.63	5.45e-007 +-3.17e-008	1.06e+001	1 of 5
Pb-214	Average:	6.52e-007 +-3.16e-008	4.47e-001	3 of 6
	241.98	1.07e-006 +-1.47e-007		
	295.21	6.74e-007 +-6.38e-008		
	351.92	6.17e-007 +-3.75e-008		
Tl-208	Average:	1.75e-007 +-1.54e-008	5.09e-002	2 of 5
	510.84	2.14e-007 +-6.48e-008		
	583.14	1.72e-007 +-1.59e-008		
Ac-228	Average:	5.69e-007 +-4.59e-008	6.13e+000	3 of 10
	338.32	6.16e-007 +-9.61e-008		
	911.07	5.47e-007 +-6.04e-008		
	969.11	5.80e-007 +-1.05e-007		
Ra-224	240.98	2.02e-006 +-2.78e-007	8.69e+001	1 of 1
Tl-210	298.00	1.64e-007 +-1.55e-008	2.17e-002	1 of 3
Bi-211	351.07	1.77e-006 +-1.08e-007	3.55e-002	1 of 1
Bi-214	Average:	7.51e-007 +-3.52e-008	3.32e-001	2 of 7
	609.31	7.33e-007 +-3.71e-008		
	1764.50	9.22e-007 +-1.13e-007		
K-40	1460.80	9.09e-006 +-3.63e-007	1.12e+013	1 of 1
TOTAL:		1.57e-005 uCi/g		

## UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
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=====  
None

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RSSI High Resolution Gamma Spectroscopy Analysis

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Quantum Technology  
GDR\_C Nuclide Activity Summary

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Sample ID: 012911 STS LAKE SHORE EAST OO-51 (2')

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Sample Size . . . . . 8.44e+002 g | Spectrum File . . H:\PCASPEC\012911.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-16-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs

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Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB  
ID. . . . . . . . . . . 500 ml Marinelli | ID. . . U, Th, & Ac Natural Series + K

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Eff.= 1/[ 7.31e-002\*En^2-2.40e+000 + 7.89e+001\*En^8.95e-001] 02-01-01 12:00

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Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

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FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife ) (hrs)	Peaks Found
<del>P</del> -235	185.72	1.44e-007 +-2.38e-008	6.17e+012	1 of 7
<del>Pb</del> -212	Average:	9.71e-007 +-3.39e-008	1.06e+001	3 of 5
	74.82	9.72e-007 +-2.16e-007		
	77.11	9.71e-007 +-1.61e-007		
	238.63	9.71e-007 +-3.52e-008		
<del>Pb</del> -214	Average:	1.19e-006 +-3.66e-008	4.47e-001	5 of 6
	74.82	8.34e-007 +-3.71e-007		
	77.11	1.06e-006 +-2.76e-007		
	241.98	1.77e-006 +-1.58e-007		
	295.21	1.16e-006 +-7.21e-008		
	351.92	1.16e-006 +-4.49e-008		
<del>Tl</del> -208	Average:	2.74e-007 +-1.92e-008	5.09e-002	3 of 5
	74.97	2.80e-007 +-6.72e-007		
	510.84	2.63e-007 +-6.90e-008		
	583.14	2.75e-007 +-2.01e-008		
<del>Ra</del> -226	186.10	I.D.Only	1.40e+007	1 of 1
<del>Ac</del> -228	Average:	1.05e-006 +-5.19e-008	6.13e+000	3 of 10
	338.32	1.03e-006 +-1.13e-007		
	911.07	1.09e-006 +-7.01e-008		
	969.11	9.82e-007 +-1.06e-007		
<del>Ra</del> -224	240.98	3.35e-006 +-2.99e-007	8.69e+001	1 of 1
<del>Tl</del> -210	298.00	2.81e-007 +-1.75e-008	2.17e-002	1 of 3
<del>Bi</del> -211	351.07	3.33e-006 +-1.29e-007	3.55e-002	1 of 1
<del>Bi</del> -214	Average:	1.14e-006 +-3.97e-008	3.32e-001	3 of 7
	609.31	1.11e-006 +-4.32e-008		
	1120.30	1.10e-006 +-1.41e-007		
	1764.50	1.47e-006 +-1.44e-007		

8-40 1460.80 8.98e-006 --3.50e-007 1.12e+013 1 cf 1

TOTAL: 2.07e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012912 STS LAKE SHORE EAST 00-51 (7')

Sample Size . . . . .	8.67e+002 g	Spectrum File . . . H:\PCASPEC\012912.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff. = 1/[ 7.31e-002\*En^(-2.40e+000) + 7.89e+001\*En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found	
<sup>18</sup> U-235	185.72	2.16e-007 +- 2.59e-008	6.17e+012	1	of 7
Pb-212	Average:	9.94e-007 +- 3.43e-008	1.06e+001	3	of 5
	74.82	9.96e-007 +- 2.15e-007			
	77.11	9.95e-007 +- 1.50e-007			
	238.63	9.94e-007 +- 3.58e-008			
Pb-214	Average:	1.39e-006 +- 3.57e-008	4.47e-001	5	of 6
	74.82	1.45e-006 +- 3.70e-007			
	77.11	1.62e-006 +- 2.58e-007			
	241.98	1.84e-006 +- 1.54e-007			
	295.21	1.31e-006 +- 7.11e-008			
	351.92	1.38e-006 +- 4.38e-008			
Tl-208	Average:	3.25e-007 +- 1.85e-008	5.09e-002	3	of 5
	74.97	3.15e-007 +- 6.70e-007			
	510.84	4.85e-007 +- 6.62e-008			
	583.14	3.11e-007 +- 1.92e-008			
Ra-226	186.10	I.D.Only	1.40e+007	1	of 1
Ac-228	Average:	9.75e-007 +- 5.47e-008	6.13e+000	3	of 10
	338.32	8.30e-007 +- 1.18e-007			
	911.07	1.06e-006 +- 7.31e-008			
	969.11	9.00e-007 +- 1.15e-007			
Ra-224	240.98	3.49e-006 +- 2.91e-007	8.69e+001	1	of 1
Tl-210	298.00	3.17e-007 +- 1.73e-008	2.17e-002	1	of 3
Bi-212	727.17	8.62e-007 +- 1.19e-007	1.01e+000	1	of 2
Bi-211	351.07	3.96e-006 +- 1.26e-007	3.55e-002	1	of 1
Bi-214	Average:	1.27e-006 +- 4.03e-008	3.32e-001	3	of 7
	609.31	1.24e-006 +- 4.44e-008			
	1120.30	1.43e-006 +- 1.37e-007			

1764.50 1.42e-006 --1.33e-007  
K-40 1460.80 6.70e-006 --3.47e-007 1.12e-013 1 of 1

TOTAL: 2.15e-006 uCi/g

UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR C Nuclide Activity Summary

Sample ID: 012913 STS LAKE SHORE EAST NN.5-51

Sample Size . . . . .	8.56e+002 g	Spectrum File . . . H:\PCASPEC\012913.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
<del>U-235</del>	185.72	1.01e-007 +-2.08e-008	6.17e+012	1 of 7
<del>Pb-212</del>	Average:	4.78e-007 +-2.86e-008	1.06e+001	2 of 5
	77.11	4.19e-007 +-1.31e-007		
	238.63	4.81e-007 +-2.93e-008		
<del>Pb-214</del>	Average:	8.55e-007 +-3.10e-008	4.47e-001	3 of 6
	241.98	1.24e-006 +-1.44e-007		
	295.21	9.12e-007 +-6.13e-008		
	351.92	8.09e-007 +-3.71e-008		
<del>Tl-208</del>	Average:	1.53e-007 +-1.62e-008	5.09e-002	2 of 5
	510.84	2.72e-007 +-5.69e-008		
	583.14	1.43e-007 +-1.69e-008		
<del>Ra-226</del>	186.10	I.D.Only	1.40e+007	1 of 1
<del>Ac-228</del>	Average:	5.01e-007 +-5.00e-008	6.13e+000	2 of 10
	338.32	4.28e-007 +-9.26e-008		
	911.07	5.31e-007 +-5.93e-008		
<del>Ra-224</del>	240.98	2.35e-006 +-2.74e-007	8.69e+001	1 of 1
<del>Tl-210</del>	298.00	2.22e-007 +-1.49e-008	2.17e-002	1 of 3
<del>Bi-211</del>	351.07	2.33e-006 +-1.07e-007	3.55e-002	1 of 1
<del>Bi-214</del>	Average:	8.78e-007 +-3.42e-008	3.32e-001	3 of 7
	609.31	8.43e-007 +-3.72e-008		
	1120.30	1.04e-006 +-1.37e-007		
	1764.50	1.10e-006 +-1.14e-007		
K-40	1460.80	1.18e-005 +-3.84e-007	1.12e+013	1 of 1
TOTAL:		1.96e-005 uCi/g		

## UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
=====							
None							

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== RSSI High Resolution Gamma Spectroscopy Analysis

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Quantum Technology  
GDR\_C Nuclide Activity Summary

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Sample ID: 012914 STS LAKE SHORE EAST 00.5-50.5 (1.5')

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Sample Size . . . . . 7.79e+002 g | Spectrum File . . .  
H:\PCASPEC\012914.SPM

Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-16-01  
00:00

Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000  
Hrs

Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000  
Hrs

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Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . .  
H:\GDR\LIB\UTHACK.LIB

ID. . . . . . . . . 500 ml Marinelli | ID. . . . U, Th, & Ac Natural Series +  
K

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Eff. = 1/[7.31e-002\*En^-2.40e+000 + 7.89e+001\*En^8.95e-001] 02-01-01  
12:00

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Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <= . . . 8.000  
Halflives  
Library Energy Tolerance. . . 2.50

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FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
=====				
U-235	185.72	7.62e-008 +-2.48e-008	6.17e+012	1 of 7
Pb-212	Average:	7.56e-007 +-3.43e-008	1.06e+001	3 of 5
	74.82	7.56e-007 +-2.00e-007		
	77.11	7.55e-007 +-1.44e-007		
	238.63	7.56e-007 +-3.59e-008		
Pb-214	Average:	9.92e-007 +-3.41e-008	4.47e-001	4 of 6
	77.11	8.91e-007 +-2.48e-007		
	241.98	1.32e-006 +-1.57e-007		
	295.21	1.10e-006 +-6.59e-008		

	351.92	9.28e-007 +-4.17e-008				
$\text{Kl-208}$	Average:	2.67e-007 +-1.80e-008	5.09e-002	3 of	5	
	74.97	2.56e-007 +-6.23e-007				
	510.84	3.70e-007 +-6.24e-008				
	583.14	2.58e-007 +-1.88e-008				
$\text{Ra-226}$	186.10	I.D.Only 1.40e+007		1 of	1	
$\text{Ac-228}$	Average:	6.83e-007 +-5.03e-008	6.13e+000	3 of	10	
	338.32	6.98e-007 +-1.03e-007				
	911.07	6.57e-007 +-6.77e-008				
	969.11	7.08e-007 +-1.09e-007				
$\text{Ra-224}$	240.98	2.51e-006 +-2.97e-007	8.69e+001	1 of	1	
$\text{Cl-210}$	298.00	2.68e-007 +-1.60e-008	2.17e-002	1 of	3	
$\text{Bi-212}$	727.17	7.95e-007 +-1.08e-007	1.01e+000	1 of	2	
$\text{Bi-211}$	351.07	2.57e-006 +-1.20e-007	3.55e-002	1 of	1	
$\text{Bi-214}$	Average:	6.47e-007 +-3.86e-008	3.32e-001	3 of	7	
	609.31	8.45e-007 +-4.19e-008				
	1120.30	8.72e-007 +-1.39e-007				
	1764.50	8.37e-007 +-1.39e-007				
$\text{K-40}$	1460.80	8.07e-006 +-3.70e-007	1.12e+013	1 of	1	
TOTAL:		1.79e-005 uCi/g				

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#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
=====	=====	=====	=====	=====	=====	=====	=====
==							
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012915 STS LAKE SHORE EAST 00.5-52.5 (1.

Sample Size . . . . .	6.65e+002 g	Spectrum File . . . H:\PCASPEC\012915.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-16-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <= . . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
U-235	185.72	1.42e-007 +-2.92e-008	6.17e+012	1 of 7
Pb-212	Average:	7.56e-007 +-3.90e-008	1.06e+001	3 of 5
	74.82	7.57e-007 +-2.41e-007		
	77.11	7.55e-007 +-1.76e-007		
	238.63	7.56e-007 +-4.05e-008		
Pb-214	Average:	9.81e-007 +-3.78e-008	4.47e-001	5 of 6
	74.82	1.05e-006 +-4.14e-007		
	77.11	7.14e-007 +-3.03e-007		
	241.98	1.39e-006 +-1.66e-007		
	295.21	1.06e-006 +-7.56e-008		
	351.92	9.27e-007 +-4.60e-008		
Tl-208	Average:	2.42e-007 +-2.07e-008	5.09e-002	3 of 5
	74.97	2.43e-007 +-7.50e-007		
	510.84	2.97e-007 +-7.62e-008		
	583.14	2.38e-007 +-2.15e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	7.06e-007 +-5.52e-008	6.13e+000	3 of 10
	338.32	7.53e-007 +-1.18e-007		
	911.07	6.78e-007 +-7.37e-008		
	969.11	7.30e-007 +-1.17e-007		
Ra-224	240.98	2.63e-006 +-3.15e-007	8.69e+001	1 of 1
Tl-210	298.00	2.57e-007 +-1.84e-008	2.17e-002	1 of 3
Bi-211	351.07	2.67e-006 +-1.32e-007	3.55e-002	1 of 1
Bi-214	Average:	1.02e-006 +-4.00e-008	3.32e-001	3 of 7
	609.31	9.93e-007 +-4.42e-008		
	1120.30	1.09e-006 +-1.28e-007		
	1764.50	1.18e-006 +-1.40e-007		

TOTAL:

1.87e-005 uCr/g

UNKNOWN PEAKS

Energy keV.	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## SOUTHERN AREA LABORATORY ANALYSIS

Boring Number	Location	Sample Depth (feet)	Pb-214 <sup>1</sup> pCi/g	Ac-228 <sup>2</sup> pCi/g	Total Radium <sup>3</sup> pCi/g
B-1	E-51.75	2' - 5'	1.05	0.94	1.99
B-2	G-49.5	4'	1.12	1.08	2.20
B-2	G-49.5	7'	1.15	0.89	2.04
B-3	G.5-50.5	1'	65.6	36.3	101.8
B-3	G.5-50.5	8' - 9'	78.0	36.6	114.6
B-4	G.5-51.5	1'	15.4	86.8	102.2
B-5	F.5-51.5	1'	1.32	1.16	2.48
B-5	F.5-51.5	6' - 7'	1.52	0.95	2.47
B-6	D.75-52.75	1'	0.86	0.68	1.54
B-6	D.75-52.75	9'	1.11	0.68	1.79
B-7	C.5-52.5	1'	0.69	0.56	1.25
B-7	C.5-52.5	3'	0.36	0.32	0.68
B-3A	H.5-49.75	6'	1.09	0.94	2.03
B-3A	H.5-49.75	3.5' - 4.5'	1.46	1.07	2.53
B-4A	G.5-52	1' - 2'	0.42	0.44	0.86
B-4A	G.5-52	6'	0.74	0.44	1.18
B-4B	G.5-52.75	3"	0.86	0.68	1.54
B-4B	G.5-52.75	5' - 6'	0.79	0.57	1.36
B-4/8	J-52.5	1' - 2'	0.73	0.38	1.11
B-4/8	J-52.5	6'	1.31	0.48	1.79
B-5A	F.5-52	1'	1.01	1.11	2.12
B-5A	F.5-52	6'	1.07	0.80	1.87
B-8A	I.25-51.5	3' - 4'	2.09	7.28	9.37
B-8A	I.25-51.5	6'	1.41	2.09	3.50
B-8B	J-51.5	1'	0.87	0.50	1.37
B-8B	J-51.5	6'	1.04	0.89	1.93
B-8	H.5-51.5	3.5' - 4'	0.76	0.56	1.32
B-8	H.5-51.5	6'	2.20	9.71	11.91
B-9	F-50.5	1'	1.41	1.54	2.95
B-9	F-50.5	7'	1.24	0.96	2.20

Highlighted samples exceed USEPA cleanup level.

1 Pb-214 is surrogate for Ra-226

2 Ac-228 is surrogate for Ra-228

3 Total Radium is Ra-226 plus Ra-228

RSSI: High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GBR-3 Nuclide Activity Summary

Sample ID: C12825 STS LAKE SHORE EAST 32 4'

Sample Size . . . . . 4.97e-002 g | Spectrum File . . H:\PCASPEC\012825.SPM  
Sampling Start. . . . . 08-03-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 08-03-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-03-00 00:00 | Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GCR\EFF\500MAR.EFF Library File. . . H:\GCR\LIB\UTHACK.LIB  
ID. . . U, Th, & Ac Natural Series + K  
500 ml Marinelli

~~Eff.= 1.1731e-002\*En^-2.40e-003 + 7.89e+001\*En^8.95e-001] 02-01-01 12:00~~

**FINAL ACTIVITY REPORT**

Nuclide	Energy keV	Conc -- 1.00sigma ppm g	Halflife (hrs)	Peaks Found	
$\text{U-235}$	185.72	1.60e-007	-3.74e-008	6.17e+012	1 of 7
$\text{Ra-221}$	Average:	1.10e-006	--4.60e-008	1.06e-001	3 of 6
	74.82	1.10e-006	--2.91e-007		
	77.11	1.10e-006	--1.65e-007		
	238.63	1.10e-006	--4.81e-008		
$\text{-Ra-214}$	Average:	1.12e-006	--4.82e-008	4.47e-001	5 of 6
	74.82	1.12e-006	--5.02e-007		
	77.11	1.12e-006	--3.19e-007		
	241.98	1.12e-006	--2.23e-007		
	195.21	1.12e-006	--9.60e-008		
	351.92	1.12e-006	--5.89e-008		
$\text{-Tl-208}$	Average:	2.93e-007	--2.64e-008	5.09e-002	3 of 5
	74.97	2.93e-007	--9.10e-007		
	510.84	3.21e-007	--9.52e-008		
	583.14	2.93e-007	--2.75e-008		
$\text{-Ra-226}$	186.10		1.0.Only	1.40e+007	1 of 1
$\text{-Ac-228}$	Average:	1.00e-006	--7.83e-008	6.13e+000	3 of 10
	338.32	1.20e-006	--1.62e-007		
	911.07	1.06e-006	--1.05e-007		
	969.11	9.76e-007	--1.70e-007		
$\text{-Ra-224}$	240.98	1.67e-006	--4.23e-007	8.69e+001	1 of 2
$\text{-Bi-211}$	351.07	3.16e-007	--1.69e-007	3.55e-002	1 of 1
$\text{-Bi-214}$	Average:	1.10e-006	--5.32e-008	3.32e-001	3 of 3
	609.31	1.77e-006	--5.90e-008		
	1120.30	1.38e-006	--1.66e-007		
	1764.50	1.11e-006	--1.83e-007		
$\text{F-40}$	1460.80	1.78e-006	--4.40e-007	1.12e-013	1 of 1

TOTAL: 1.26e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GCR\_C Nuclide Activity Summary

Sample ID: C12826 STS LAKE SHORE EAST 82 7'

Sample Size . . . . . 6.42e-002 g . Spectrum File . . H:\PCASPEC\012826.SPM  
Sampling Start. . . . . 00-00-00 00:00 : Counting Start. . . . . 09-14-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 : Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 : Decay Time [OFF]. . . . . 0.00e+000 Hrs

Efficiency File:H:\GCR\_EFF\500MAR.EFF Library File. . . H:\GCR\LIB\UTHACK.LIB  
10. . . . . 500 -1 Marinelli ID. . . U, Th, & Ac Natural Series + K

Eff.= 1 [(7.31e-002\*En^2-1.40e-000 - 7.89e-001\*En^8.95e-001) 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 & Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy keV	Count -- 1.00sigma sec1 g	Halflife (hrs)	Peaks Found
U-238	165.72	1.17e-007	--1.99e-008	6.17e-012
U-238	Average:	9.69e-007	--3.76e-008	1.06e-001
U-238	74.92	9.71e-007	--2.50e-007	
U-238	77.11	9.69e-007	--1.67e-007	
U-238	238.63	9.69e-007	--3.91e-008	
Pa-214	Average:	1.15e-006	--4.11e-008	4.47e-001
Pa-214	74.92	1.17e-006	--4.30e-007	
Pa-214	77.11	1.17e-006	--2.88e-007	
Pa-214	241.98	1.17e-006	--1.65e-007	
Pa-214	195.21	1.17e-006	--6.43e-008	
Pa-214	351.92	1.14e-006	--4.97e-008	
Bi-214	Average:	1.61e-007	--2.26e-008	5.09e-002
Bi-214	74.97	1.52e-007	--7.78e-007	
Bi-214	510.84	1.84e-007	--8.33e-008	
Bi-214	583.14	2.60e-007	--2.35e-008	
Pa-214	186.10		1.0.Only	1.40e+007
Ac-228	Average:	9.87e-007	--6.08e-008	6.13e+000
Ac-228	338.32	9.90e-007	--1.39e-007	
Ac-228	911.07	9.38e-007	--7.86e-008	
Ac-228	969.11	7.39e-007	--1.32e-007	
Pa-214	243.98	1.34e-006	--3.50e-007	5.69e-001
Bi-214	Average:	1.12e-006	--4.87e-008	3.32e-001
Bi-214	609.31	1.08e-006	--5.43e-008	
Bi-214	1120.30	1.01e-006	--1.69e-007	
Bi-214	1764.50	1.48e-006	--1.44e-007	
Tl-204	1460.80	9.45e-006	--4.21e-007	1.12e-013

TOTAL: 1.52e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
=====							
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: C12827 STS LAKE SHORE EAST B3 1"

Sample Size . . . . . 5.60e-002 g . Spectrum File . . H:\PCASPEC\312827.SPM  
Sampling Start. . . . . 08-03-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 08-03-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-03-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs

Gamma Fraction Limit >= . . . 10.00 & Decay Limit <= . . . 5.000 Halflives  
Library Energy Tolerance. . . 2.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc -- 1.00sigma ppm/g	Halflife hrs.	Peaks Found
Pa-210	Average:	5.56e-006	--3.36e-007	2.74e-002
	63.78	4.25e-006	--5.08e-007	
	94.30	6.58e-006	--1.06e-006	
	154.21	6.57e-006	--1.57e-006	
	253.46	6.57e-006	--5.22e-007	
U-235	Average:	8.45e-006	--1.55e-007	6.17e+012
	89.95	8.81e-005	--3.21e-006	
	93.35	1.72e-005	--2.67e-006	
	185.72	8.21e-006	--1.56e-007	
Ta-184	Average:	4.11e-005	--2.72e-006	5.78e-002
	63.29	2.88e-005	--5.67e-006	
	92.38	4.45e-005	--4.36e-006	
	92.80	4.51e-005	--4.42e-006	
U-236	66.38	1.13e-003	--2.23e-004	3.91e+013
Pa-212	Average:	3.62e-005	--2.23e-007	1.06e-001
	74.82	3.65e-005	--1.52e-006	
	77.11	3.28e-005	--1.34e-006	
	87.30	3.65e-005	--1.49e-006	
	238.63	3.65e-005	--2.35e-007	
	300.09	3.06e-005	--2.29e-006	
Pa-214	Average:	6.56e-005	--2.73e-007	4.47e-001
	74.82	6.60e-005	--2.62e-006	
	77.11	6.60e-005	--1.79e-006	
	87.30	4.10e-005	--2.56e-006	
	241.98	6.60e-005	--1.03e-006	
	295.21	6.60e-005	--5.41e-007	
	351.92	6.58e-005	--3.44e-007	

Tl-208	Average:	1.17e-005	+ -1.24e-007	5.09e-002	5 of 5
	74.97	1.16e-005	+ -4.75e-006		
	277.35	6.60e-006	+ -9.94e-007		
	510.84	1.32e-005	+ -4.12e-007		
	583.14	1.16e-005	+ -1.34e-007		
	860.37	1.38e-005	+ -6.95e-007		
Pa-234	Average:	4.33e-006	+ -3.78e-007	6.70e+000	2 of 14
	94.66	4.33e-006	+ -7.57e-007		
	131.20	4.33e-006	+ -4.36e-007		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1	
Ac-228	Average:	3.63e-005	+ -3.18e-007	6.13e+000	10 of 10
	209.28	3.11e-005	+ -1.87e-006		
	270.23	1.13e-005	+ -1.97e-006		
	327.64	2.94e-005	+ -2.16e-006		
	338.32	3.63e-005	+ -7.45e-007		
	409.51	3.66e-005	+ -3.77e-006		
	463.00	3.48e-005	+ -1.70e-006		
	794.70	3.11e-005	+ -1.84e-006		
	911.07	3.73e-005	+ -4.87e-007		
	964.60	4.18e-005	+ -1.67e-006		
	969.11	3.88e-005	+ -6.95e-007		
Ra-224	240.98	3.54e-005	+ -1.95e-006	8.69e+001	1 of 1
Bi-212	727.17	2.37e-005	+ -7.86e-007	1.01e+000	1 of 2
Bi-214	Average:	6.17e-005	+ -3.03e-007	3.32e-001	7 of 7
	609.31	5.97e-005	+ -3.49e-007		
	768.36	5.77e-005	+ -2.03e-006		
	934.06	6.11e-005	+ -2.84e-006		
	1120.30	6.44e-005	+ -9.52e-007		
	1238.10	6.45e-005	+ -1.96e-006		
	1377.70	7.56e-005	+ -3.13e-006		
	1764.50	7.63e-005	+ -1.09e-006		
Po-210	803.10	6.93e-002	+ -7.33e-003	3.32e+003	1 of 1
Po-216	804.90	4.23e-002	+ -4.48e-003	4.06e-005	1 of 1
K-40	1460.80	1.73e-005	+ -1.03e-006	1.12e+013	1 of 1

TOTAL: 1.13e-001 uCi/g

#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
105.84	440.60	1075	261	523	16815	1.32	7.913e+000
259.21	1069.51	729	194	392	8917	1.02	5.148e+000
562.63	2314.21	469	122	250	3005	0.97	6.179e+000
665.17	2734.96	1153	116	233	2400	1.82	1.760e+001
771.45	3171.05	325	94	192	1744	1.63	5.657e+000
785.29	3227.88	1150	99	192	1855	1.75	2.034e+001
835.21	3432.70	585	80	158	1223	1.66	1.093e+001
838.93	3447.97	941	85	165	1285	2.51	1.765e+001
1154.19	4741.45	897	84	166	1134	1.83	2.236e+001
1279.87	5256.91	631	75	149	914	1.67	1.725e+001
1384.03	5684.02	297	82	173	941	1.89	8.706e+000
1400.23	5750.44	670	72	144	711	2.37	1.984e+001
1406.80	5777.37	1142	79	153	765	2.40	3.397e+001
1507.75	6191.18	888	75	146	873	2.43	2.810e+001

1596.73	6614.95	795	65	122	617	2.03	2.633e+001
1591.68	6635.01	426	63	130	664	1.97	1.415e+001
1619.16	6647.73	302	61	121	599	1.94	1.019e+001
1629.22	6638.93	466	62	103	415	2.40	1.580e+001
1659.67	6613.66	466	64	104	425	1.85	1.607e+001
1728.17	7094.25	1468	69	95	359	2.55	5.248e-001
1846.01	7676.71	852	67	104	411	2.16	3.231e-001

K-40 1460.80 8.88e-006 +-4.26e-007 1.12e+013 1 of 1

TOTAL: 1.83e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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RSSI High Resolution Gamma Spectroscopy Analysis

#### Quantum Technology SDR C Nuclide Activity Summary

Sample 10: C12916 STS LAKE SHORE EAST PP-59 (12")

Sample Size . . . . . 7.60e-002 g | Spectrum File . . H:\PCASPEC\012916.SPM  
Sampling Start. . . . . 08-08-00 00:00 | Counting Start. . . . . 08-16-01 00:00  
Sampling Stop . . . . . 08-08-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-08-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff. = 1.0 - 3.81e-002\*En^2 - 2.40e-002 + [-7.89e-001\*En^8, 9.55e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 \* Decay Limit <= . . . 5.000 Halflives  
Library Energy Tolerance. . . 1.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy keV	Conc -- 1.00sigma uCi/g	Halflife (hrs)	Peaks Found
$\mu$ -135	185.72	1.20e-007	2.45e-008	6.17e+012
$\mu$ -211	Average:	8.86e-007	--2.91e-008	1.06e-001
	74.82	8.86e-007	--2.18e-007	
	77.11	8.86e-007	--1.34e-007	
	238.63	8.86e-007	--3.00e-008	
$\mu$ -214	Average:	1.03e-006	--3.52e-008	4.47e-001
	74.82	1.13e-006	--3.75e-007	
	77.11	1.39e-007	--2.30e-007	
	141.99	1.38e-006	--1.59e-007	
	295.21	9.59e-007	--6.61e-008	
	351.92	1.03e-006	--4.37e-008	
$\pi$ -208	Average:	1.60e-007	--1.81e-008	5.09e-002
	74.97	1.49e-007	--6.79e-007	
	510.84	2.61e-007	--7.04e-008	
	583.14	1.53e-007	--1.88e-008	
$\pi$ -226	186.10		1.0.Only	1.40e-007
$\mu$ -228	Average:	6.90e-007	--5.46e-008	6.13e-000
	339.32	6.93e-007	--1.08e-007	
	911.07	6.92e-007	--6.34e-008	
$\mu$ -224	240.98	2.61e-006	--3.02e-007	8.69e-001
$\pi$ -210	298.00	2.40e-007	--1.65e-008	2.17e-002
$\pi$ -211	351.07	2.97e-006	--1.26e-007	3.55e-002
$\pi$ -214	Average:	1.02e-006	--3.92e-008	3.32e-001
	609.31	9.95e-007	--4.23e-008	
	1120.33	9.68e-007	--1.61e-007	
	1764.50	1.23e-006	--1.36e-007	
$\pi$ -40	1460.81	9.15e-006	--3.71e-007	1.12e+013

	510.84	1.36e-005	+ -3.74e-007					
	583.14	1.17e-005	+ -1.29e-007					
	860.37	1.35e-005	+ -7.14e-007					
Pa-234	Average:	3.41e-006	+ -3.60e-007	6.70e+000	2 of	14		
	94.66	3.41e-006	+ -6.64e-007					
	131.20	3.41e-006	+ -4.28e-007					
Ra-226	186.10	I.D.Only	1.40e+007	1 of	1			
Ac-228	Average:	3.66e-005	+ -2.99e-007	6.13e+000	10 of	10		
	209.28	3.32e-005	+ -1.76e-006					
	270.23	8.59e-006	+ -2.01e-006					
	327.64	2.91e-005	+ -2.11e-006					
	338.32	3.61e-005	+ -6.93e-007					
	409.51	2.97e-005	+ -3.32e-006					
	463.00	3.73e-005	+ -1.69e-006					
	794.70	3.17e-005	+ -1.75e-006					
	911.07	3.74e-005	+ -4.47e-007					
	964.60	4.12e-005	+ -1.67e-006					
	969.11	4.00e-005	+ -6.79e-007					
Ra-224	240.98	3.90e-005	+ -1.91e-006	8.69e+001	1 of	1		
Bi-212	727.17	2.38e-005	+ -7.38e-007	1.01e+000	1 of	2		
Bi-211	351.07	1.78e-006	+ -9.77e-007	3.55e-002	1 of	1		
Bi-214	Average:	7.49e-005	+ -3.00e-007	3.32e-001	7 of	7		
	609.31	7.27e-005	+ -3.48e-007					
	768.36	7.02e-005	+ -1.98e-006					
	934.06	7.43e-005	+ -2.78e-006					
	1120.30	7.75e-005	+ -9.16e-007					
	1238.10	7.74e-005	+ -1.95e-006					
	1377.70	8.90e-005	+ -3.05e-006					
	1764.50	9.10e-005	+ -1.06e-006					
Po-216	804.90	5.23e-002	+ -4.41e-003	4.06e-005	1 of	1		
K-40	1460.80	1.39e-005	+ -1.00e-006	1.12e+013	1 of	1		
TOTAL:		5.27e-002	uCi/g					

#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
259.16	1069.28	1338	270	552	15316	1.02	9.447e+000
487.08	2004.24	679	157	322	4995	1.82	7.892e+000
562.08	2311.98	513	145	298	4267	1.52	6.753e+000
665.20	2735.10	1791	142	284	3571	1.76	2.734e+001
702.67	2888.83	590	141	292	3767	1.51	9.454e+000
771.82	3172.57	727	88	169	1693	2.08	1.266e+001
785.35	3228.09	1798	126	249	2848	1.92	3.180e+001
835.13	3432.38	673	85	165	1508	1.66	1.257e+001
838.90	3447.83	1310	121	244	2421	2.87	2.456e+001
1154.17	4741.33	1542	93	177	1388	1.99	3.843e+001
1279.88	5256.98	1008	88	172	1261	2.40	2.755e+001
1384.22	5684.81	438	101	214	1430	1.89	1.284e+001
1400.30	5750.73	849	98	201	1277	1.89	2.515e+001
1406.82	5777.48	1617	93	179	1106	2.20	4.809e+001
1507.96	6192.06	1295	97	191	1442	2.04	4.098e+001
1586.83	6515.25	1054	81	157	909	1.97	3.491e+001
1591.42	6534.06	653	76	151	872	2.86	2.169e+001

1619.28	6649.21	394	73	149	905	1.70	1.329e+001
1629.43	6629.82	472	70	142	798	2.09	1.601e+001
1659.68	6814.55	581	63	122	633	2.25	2.004e+001
1728.25	7034.56	2355	76	124	570	2.40	8.420e+001
1846.00	7576.64	1477	65	110	464	2.49	5.601e+001

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012829 STS LAKE SHORE EAST B4 1'

Sample Size . . . . .	5.28e+002 g	Spectrum File . . H:\PCASPEC\012829.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
/Ra-223	Average:	8.99e-006 +- 3.91e-007	2.74e+002	4 of 7
	83.78	6.86e-006 +- 5.79e-007		
	94.90	1.08e-005 +- 1.18e-006		
	154.21	1.08e-005 +- 1.51e-006		
	269.46	1.08e-005 +- 6.47e-007		
/U-235	Average:	2.66e-006 +- 1.58e-007	6.17e+012	3 of 7
	89.95	1.59e-004 +- 4.06e-006		
	93.35	4.76e-005 +- 2.97e-006		
	185.72	2.30e-006 +- 1.58e-007		
/Th-234	Average:	7.84e-005 +- 3.46e-006	5.78e+002	2 of 3
	92.38	7.79e-005 +- 4.86e-006		
	92.80	7.90e-005 +- 4.93e-006		
/Pb-212	Average:	8.29e-005 +- 3.12e-007	1.06e+001	5 of 5
	74.82	8.32e-005 +- 1.60e-006		
	77.11	8.12e-005 +- 1.08e-006		
	87.30	8.32e-005 +- 1.67e-006		
	238.63	8.32e-005 +- 3.43e-007		
	300.09	7.52e-005 +- 2.32e-006		
/Pb-214	Average:	1.54e-005 +- 2.03e-007	4.47e-001	6 of 6
	74.82	1.55e-005 +- 2.75e-006		
	77.11	1.55e-005 +- 1.85e-006		
	87.30	1.93e-006 +- 2.87e-006		
	241.98	1.55e-005 +- 8.46e-007		
	295.21	1.55e-005 +- 4.58e-007		
	351.92	1.55e-005 +- 2.38e-007		
/Tl-208	Average:	2.77e-005 +- 1.71e-007	5.09e-002	5 of 5
	74.97	2.74e-005 +- 4.98e-006		

	277.35	2.48e-005	--1.61e-006					
	510.84	2.86e-005	--5.16e-007					
	583.14	2.74e-005	--1.87e-007					
	860.37	3.21e-005	--7.88e-007					
/Pa-234	Average:	5.37e-006	--3.17e-007	6.70e+000	4 of 14			
	94.66	2.29e-006	--8.44e-007					
	98.44	2.29e-006	--6.20e-007					
	111.00	3.31e-006	--8.12e-007					
	131.20	8.69e-006	--4.75e-007					
/Ac-227	115.35	4.53e-004	--9.87e-005	1.91e+005	1 of 1			
/Ra-226	186.10		I.D.Only	1.40e+007	1 of 1			
/Ac-228	Average:	8.68e-005	--4.21e-007	6.13e+000	10 of 10			
	209.28	7.69e-005	--2.19e-006					
	270.23	3.80e-005	--2.44e-006					
	327.64	7.21e-005	--2.90e-006					
	338.32	8.27e-005	--9.98e-007					
	409.51	6.59e-005	--3.76e-006					
	463.00	7.96e-005	--2.09e-006					
	794.70	7.74e-005	--2.23e-006					
	911.07	9.18e-005	--6.77e-007					
	964.60	8.80e-005	--1.84e-006					
	969.11	9.51e-005	--9.26e-007					
/Ra-224	240.98	1.14e-004	--1.60e-006	8.69e+001	1 of 1			
/Bi-212	727.17	5.25e-005	--1.02e-006	1.01e+000	1 of 2			
/Bi-211	831.96	1.68e-005	--3.30e-006	6.02e-001	1 of 3			
/Bi-214	Average:	1.44e-005	--2.08e-007	3.32e-001	7 of 7			
	609.31	1.41e-005	--2.37e-007					
	768.36	1.12e-005	--1.64e-006					
	934.06	1.28e-005	--2.53e-006					
	1120.30	1.49e-005	--6.58e-007					
	1238.10	1.92e-005	--1.55e-006					
	1377.70	1.60e-005	--2.45e-006					
	1764.50	1.64e-005	--7.39e-007					
X-40	1460.80	1.04e-005	--1.05e-006	1.12e+013	1 of 1			
TOTAL:		9.79e-004	uCi/g					

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
106.05	4411.47	3541	376	791	22715	1.63	2.601e-001
362.34	2313.01	1098	137	278	3556	1.34	1.446e-001
754.88	3103.09	612	143	316	2835	1.65	1.045e-001
762.79	3135.54	387	145	308	3239	1.63	6.669e-003
771.97	3173.19	1370	115	233	1889	2.09	2.386e-001
785.15	3227.28	920	98	193	1957	1.89	1.627e-001
835.26	3432.89	1656	86	157	1246	2.09	3.093e-001
839.65	3450.91	926	93	189	1250	1.92	1.738e-001
903.61	3713.36	494	103	217	1494	1.69	9.897e-003
1077.89	4428.43	406	64	129	702	1.60	9.519e-000
1093.45	4492.25	559	66	129	702	2.10	1.327e-001
1109.57	4558.40	384	65	130	693	1.99	9.239e-000
1245.64	5116.52	560	84	175	805	3.25	1.494e-001
1494.57	6137.19	541	56	108	415	2.24	1.699e-001

1500.25	6160.46	285	56	114	443	2.14	8.978e+000
1579.10	6483.57	288	68	144	554	2.03	9.498e+000
1586.82	6515.22	2001	66	103	459	2.16	6.628e+001
1591.08	6532.69	1028	61	112	422	2.38	3.413e+001
1619.24	6648.04	795	65	124	630	2.25	2.681e+001
1629.30	6689.27	995	62	116	411	2.15	3.375e+001
1636.83	6720.13	260	56	117	415	1.98	8.855e+000
1728.40	7095.17	403	48	94	334	2.14	1.441e+001

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RSSI High Resolution Gamma Spectroscopy Analysis  
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Quantum Technology  
GDR\_C Nuclide Activity Summary  
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Sample ID: C12830 STS LAKE SHORE EAST B5 1'

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Sample Size . . . . . 4.37e-002 g | Spectrum File . . H:\PCASPEC\C12830.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF Library File. . . H:\GDR\LIB\UTHACK.LIB  
File . . . . . 500 RL Marinelli ID. . . U, Th, & Ac Natural Series + K

Eff. = 1.1731e-002\*En^-2.40e-003 + 7.89e-001\*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc -- 1.00sigma uCi/g	Halflife ) (hrs)	Peaks Found
$\text{K-40}$	106.72	1.73e-007	--3.68e-008	6.17e-012 1 of 7
$\text{Ca-40}$	238.63	1.13e-006	--5.96e-008	1.06e-001 1 of 5
$\text{Ba-134}$	Average:	1.32e-006	--5.21e-008	4.47e-001 3 of 6
	241.93	1.36e-006	--1.93e-007	
	295.21	1.36e-006	--1.04e-007	
	351.92	1.32e-006	--6.34e-008	
$\text{Fe-55}$	Average:	4.02e-007	--2.77e-008	5.09e-002 2 of 5
	510.84	6.19e-007	--1.12e-007	
	583.14	3.88e-007	--2.86e-008	
$\text{Ra-226}$	106.10		--0.Only	1.40e+007 1 of 1
$\text{Ra-228}$	Average:	1.16e-006	--3.18e-008	6.13e-000 3 of 10
	336.32	1.18e-006	--1.77e-007	
	911.07	1.19e-006	--1.04e-007	
	969.11	1.02e-006	--1.98e-007	
$\text{Bi-214}$	Average:	1.21e-006	--5.90e-008	3.32e-001 3 of 7
	609.31	1.13e-006	--6.52e-008	
	1120.30	1.49e-006	--1.97e-007	
	1764.50	1.68e-006	--1.96e-007	
$\text{Y-40}$	1460.80	7.02e-006	--4.96e-007	1.12e-013 1 of 1
TOTAL:		1.24e-005 uCi/g		

UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
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None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012831 STS LAKE SHORE EAST 35 6'-7'

Sample Size . . . . .	4.63e+002 g	Spectrum File . . . H:\PCASPEC\012831.SPM
Sampling Start. . . . .	00-30-00 03:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	00-30-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-30-00 03:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

2000-02-01 12:00

Gamma Fraction Limit >= . . . 10.00 & ! Decay Limit <= . . . 8.000 Halflives  
Literacy Energy Tolerance. . . 2.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc -- 1.00sigma uCi/g	Halflife (hrs)	Peaks Found	
U-235	185.72	2.33e-007	--3.90e-008	6.17e-012	1 of 7
Zr-91	Average:	1.10e-006	--5.22e-008	1.06e-001	3 of 5
	74.82	1.10e-006	--3.61e-007		
	77.11	1.10e-006	--2.23e-007		
	238.63	1.10e-006	--5.43e-008		
Zr-91	Average:	1.52e-006	--5.46e-008	4.47e-001	5 of 6
	74.82	9.07e-007	--6.21e-007		
	77.11	1.55e-006	--3.84e-007		
	241.98	1.55e-006	--2.24e-007		
	195.21	1.55e-006	--1.03e-007		
	351.92	1.51e-006	--6.72e-008		
Zr-91	Average:	2.99e-007	--3.14e-008	5.09e-002	2 of 5
	510.84	5.01e-007	--1.06e-007		
	593.14	2.50e-007	--3.29e-008		
Zr-91	196.10		I.D.Only	1.40e+007	1 of 1
Zr-91	Average:	9.49e-007	--8.08e-008	6.13e+000	3 of 10
	338.32	1.21e-006	--1.64e-007		
	911.07	8.25e-007	--1.11e-007		
	969.11	9.58e-007	--1.69e-007		
Sr-89	Average:	1.44e-006	--6.10e-008	3.32e-001	3 of 7
	609.31	1.41e-006	--6.66e-008		
	1120.30	1.46e-006	--2.38e-007		
	1764.50	1.68e-006	--1.96e-007		
K-40	1460.93	9.38e-006	--4.84e-007	1.12e+013	1 of 1
TOTAL:		1.46e-005	uCi/g		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI: High Resolution Gamma Spectroscopy Analysis

**Quantum Technology**  
**GOR-C Nuclide Activity Summary**

Sample ID: 012332 STS LAKE SHORE EAST B6 1'

Sample Size . . . . .	6.84e+002 g	Spectrum File . . . H:\PCASPEC\012832.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff. = 1.0 - 3.18e-002\*En^2 - 2.40e-003 + 7.89e+001\*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 & ! Decay Limit <= . . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## **FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc -- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
$\text{U-235}$	185.72	1.10e-007	--2.75e-008	6.17e+012
$\text{Pu-242}$	238.63	6.62e-007	--3.45e-008	1.06e-001
$\text{Pu-244}$	Average:	8.56e-007	--3.50e-008	4.47e-001
	241.93	1.42e-006	--1.64e-007	
	295.21	8.67e-007	--7.00e-008	
	351.92	8.16e-007	--4.17e-008	
$\text{Tl-208}$	Average:	1.91e-007	--1.03e-008	5.09e-002
	510.84	2.18e-007	--7.41e-008	
	583.14	1.69e-007	--1.89e-008	
$\text{Ra-226}$	186.10		--I.D.Only	1.40e-007
$\text{Ra-228}$	Average:	6.75e-007	--5.45e-008	6.13e+000
	335.32	7.62e-007	--1.11e-007	
	911.07	5.84e-007	--7.66e-008	
	963.11	7.75e-007	--1.09e-007	
$\text{Ra-224}$	240.98	2.69e-006	--3.11e-007	8.69e-001
$\text{Tl-210}$	298.00	2.11e-007	--1.70e-008	2.17e-002
$\text{Bi-211}$	351.07	2.35e-006	--1.20e-007	3.55e-002
$\text{Bi-214}$	Average:	8.16e-007	--3.93e-008	3.32e-001
	609.31	7.75e-007	--4.46e-008	
	1120.30	9.43e-007	--1.41e-007	
	1764.50	9.62e-007	--1.03e-007	
$\text{K-40}$	1460.80	1.14e-005	--4.41e-007	1.12e+013
TOTAL:		2.00e-005	uCi/g	

## UNKNOWN: PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GBR C Nuclide Activity Summary

Sample ID: 012833 STS LAKE SHORE EAST B6 9'

Sample Size . . . . . 1.0e-003 g | Spectrum File . . . H:\PCASPEC\012833.SPM  
Sampling Start. . . . . 03-03-30 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 03-03-30 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 03-03-30 00:00 | Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff. = 1/( -3.31e-002\*En^2 - 2.43e-003 - 7.89e+001\*En^8.95e-001) 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 & ! Decay Limit <= . . . 6.000 Halflives  
Library Energy Tolerance. . . 2.50

## **FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc -- 1.00sigma uCi/g	Halflife (hrs)	Peaks Found	
<sup>133</sup> Te-213	94.93	8.81e-007	--1.59e-007	2.74e-002	1 of 7
<sup>133</sup> U-235	Average:	1.57e-007	--2.30e-008	6.17e-012	2 of 7
	93.35	2.21e-006	--3.99e-007		
	185.72	1.50e-007	--2.31e-008		
<sup>133</sup> Zn-234	Average:	3.65e-006	--4.64e-007	5.78e-002	2 of 3
	92.38	3.62e-006	--6.52e-007		
	92.80	3.67e-006	--6.61e-007		
<sup>133</sup> Ps-212	Average:	6.64e-007	--2.99e-008	1.06e+001	3 of 5
	74.82	6.65e-007	--1.81e-007		
	77.11	6.64e-007	--1.23e-007		
	238.63	6.64e-007	--3.13e-008		
<sup>134</sup> Po-214	Average:	1.11e-006	--3.05e-008	4.47e-001	5 of 6
	74.82	1.16e-006	--3.12e-007		
	77.11	1.05e-006	--2.12e-007		
	241.98	1.26e-006	--1.28e-007		
	295.21	1.11e-006	--6.20e-008		
	351.92	1.10e-006	--3.73e-008		
<sup>134</sup> Tl-208	Average:	1.66e-007	--1.63e-008	5.09e-002	3 of 5
	74.97	1.61e-007	--5.64e-007		
	510.84	1.99e-007	--6.01e-008		
	593.14	1.63e-007	--1.69e-008		
<sup>134</sup> Pa-234	94.66	6.29e-007	--1.13e-007	6.70e+000	1 of 14
<sup>134</sup> Pa-226	186.10		I.D.Only	1.40e+007	1 of 1
<sup>134</sup> Ac-226	Average:	6.76e-007	--4.33e-008	6.13e+000	3 of 10
	339.32	6.00e-007	--9.71e-008		
	911.07	6.74e-007	--5.95e-008		
	969.11	7.73e-007	--9.60e-008		

Ra-224	240.98	2.40e-006	$\pm$ 2.44e-007	8.69e+001	1 of 1
Tl-210	298.00	2.70e-007	$\pm$ 1.51e-008	2.17e-002	1 of 3
Bi-212	727.17	4.57e-007	$\pm$ 1.01e-007	1.01e+000	1 of 2
Bi-211	351.07	3.16e-006	$\pm$ 1.07e-007	3.55e-002	1 of 1
Bi-214	Average:	1.04e-006	$\pm$ 3.43e-008	3.32e-001	3 of 7
	609.31	1.02e-006	$\pm$ 3.74e-008		
	1120.30	9.44e-007	$\pm$ 1.34e-007		
	1764.50	1.25e-006	$\pm$ 1.11e-007		
K-40	1460.80	1.77e-005	$\pm$ 4.13e-007	1.12e+013	1 of 1
TOTAL:		3.30e-005	uCi/g		

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#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
=====							
None							



RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR\_C Nuclide Activity Summary

Sample ID: 012835 STS LAKE SHORE EAST B7 3'

Sample Size . . . . .	8.47e+002 g	Spectrum File . . . H:\PCASPEC\012835.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Pb-212	238.63	2.62e-007 +-2.84e-008	1.06e+001	1 of 5
Pb-214	Average:	3.63e-007 +-2.69e-008	4.47e-001	2 of 6
	295.21	3.63e-007 +-5.52e-008		
	351.92	3.63e-007 +-3.09e-008		
Tl-208	583.14	9.99e-008 +-1.42e-008	5.09e-002	1 of 5
Ac-228	Average:	3.15e-007 +-4.52e-008	6.13e+000	2 of 10
	338.32	3.13e-007 +-8.47e-008		
	911.07	3.16e-007 +-5.34e-008		
Ra-224	240.98	2.97e-006 +-3.20e-007	8.69e+001	1 of 1
Bi-211	351.07	2.05e-007 +-8.88e-008	3.55e-002	1 of 1
Bi-214	609.31	4.42e-007 +-2.98e-008	3.32e-001	1 of 7
K-40	1460.80	1.18e-005 +-3.76e-007	1.12e+013	1 of 1
<b>TOTAL:</b>		<b>1.64e-005 uCi/g</b>		

## UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
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None

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012836 STS LAKE SHORE EAST B3A 6'

Sample Size . . . . . 6.58e-002 g : Spectrum File . . H:\PCASPEC\012836.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-03-03 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff. = 1.7e-316e-002\*En^1-2.40e-003 + 7.89e-001\*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 & ! Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conc -- 1.00sigma [uCi/g]	Halflife (hrs)	Peak's Found
$\text{Pa-223}$	94.90	7.10e-007	--2.29e-007	2.74e-002
$\text{U-235}$	Average:	9.42e-008	--2.78e-008	6.17e-012
	93.35	1.78e-006	--5.76e-007	
	185.72	9.02e-008	--2.79e-008	
$\text{Th-234}$	Average:	2.94e-006	--6.71e-007	5.78e+002
	92.38	2.92e-006	--9.42e-007	
	92.80	2.96e-006	--9.55e-007	
$\text{Po-212}$	Average:	9.02e-007	--4.04e-008	1.06e-001
	74.82	9.02e-007	--2.82e-007	
	77.11	9.03e-007	--1.69e-007	
	239.63	9.02e-007	--4.21e-008	
$\text{Rb-214}$	Average:	1.09e-006	--3.81e-008	4.47e-001
	74.82	1.09e-006	--4.86e-007	
	77.11	1.09e-006	--2.91e-007	
	241.98	1.09e-006	--1.58e-007	
	295.21	1.09e-006	--7.97e-008	
	351.92	1.09e-006	--4.59e-008	
$\text{Tl-208}$	Average:	3.12e-007	--2.21e-008	5.09e-002
	74.97	3.04e-007	--8.80e-007	
	510.84	3.51e-007	--8.09e-008	
	583.14	3.09e-007	--2.30e-008	
$\text{Ra-234}$	94.66	5.07e-007	--1.64e-007	6.70e+000
$\text{Ra-226}$	196.10		I.D.Only	1.40e+007
$\text{Ac-228}$	Average:	9.42e-007	--6.19e-008	6.13e+000
	339.32	9.53e-007	--1.24e-007	
	911.07	9.27e-007	--8.53e-008	
	969.11	9.64e-007	--1.31e-007	

Ra-224	240.98	1.10e-006	+ -3.00e-007	8.69e+001	1 of	1
Bi-214	Average:	1.12e-006	+ -4.56e-008	3.32e-001	3 of	7
	609.31	1.07e-006	+ -5.06e-008			
	1120.30	1.18e-006	+ -1.53e-007			
	1764.50	1.48e-006	+ -1.44e-007			
K-40	1460.80	1.12e-005	+ -4.36e-007	1.12e+013	1 of	1
TOTAL:		2.09e-005	uCi/g			

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#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI: High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR-C Nuclide Activity Summary

Sample 10: 012637 STS LAKE SHORE EAST B3A 3.5'-4.5'

Sample Size . . . . . 6.61e+002 g | Spectrum File . . H:\PCASPEC\012837.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 08-30-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff. = 1.7731e-032\*En^(-2.43e-003) + 7.89e+001\*En^(8.95e-001) C2-31-31 12:00

Gamma Fraction Limit >= . . . 10.00 % ! Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

**FINAL ACTIVITY REPORT**

Nuclide	Energy (keV)	Conn -- 1.00sigma nCi/g	Halflife (hrs)	Peaks Found	
$\mu\text{-}223$	94.90	1.11e-006	--2.27e-007	2.74e+002	1 of 7
$\mu\text{-}235$	Average:	2.19e-007	--3.02e-008	6.17e+012	2 of 7
	93.35	2.78e-006	--5.71e-007		
	185.72	2.12e-007	--3.03e-008		
$\mu\text{-}234$	Average:	4.58e-006	--6.65e-007	5.78e+002	2 of 3
	92.38	4.55e-006	--9.34e-007		
	92.80	4.61e-006	--9.47e-007		
$\mu\text{-}212$	Average:	9.09e-007	--4.11e-008	1.06e-001	3 of 5
	74.82	9.09e-007	--2.71e-007		
	77.11	9.09e-007	--1.78e-007		
	238.63	9.09e-007	--4.28e-008		
$\mu\text{-}214$	Average:	1.46e-006	--4.15e-008	4.47e-001	5 of 6
	74.82	1.46e-006	--4.66e-007		
	77.11	1.46e-006	--3.07e-007		
	241.98	1.46e-006	--1.68e-007		
	295.21	1.46e-006	--8.31e-008		
	351.92	1.46e-006	--5.09e-008		
$\mu\text{-}208$	Average:	3.03e-007	--2.33e-008	5.09e-002	3 of 5
	74.97	3.04e-007	--8.43e-007		
	510.84	2.69e-007	--7.87e-008		
	583.14	3.07e-007	--2.44e-008		
$\mu\text{-}234$	94.66	7.90e-007	--1.62e-007	6.70e+000	1 of 14
$\mu\text{-}226$	186.10		1.0.Only	1.40e-007	1 of 1
$\mu\text{-}228$	Average:	1.07e-006	--6.35e-008	6.13e+000	3 of 10
	338.32	1.08e-006	--1.30e-007		
	911.07	1.02e-006	--8.87e-008		
	969.11	1.16e-006	--1.27e-007		

Ra-224	240.98	6.72e-007	+ -3.19e-007	8.69e+001	1 of	1
Bi-214	Average:	1.36e-006	+ -4.68e-008	3.32e-001	3 of	7
	609.31	1.26e-006	+ -5.11e-008			
	1120.30	1.82e-006	+ -1.59e-007			
	1764.50	1.94e-006	+ -1.72e-007			
K-40	1460.80	1.19e-005	+ -4.60e-007	1.12e+013	1 of	1
TOTAL:		2.44e-005	uCi/g			

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#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							



RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012839 STS LAKE SHORE EAST B4A 6'

Sample Size . . . . . 8.77e+002 g | Spectrum File . . H:\PCASPEC\012839.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-14-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff. =  $1/[7.31e-002 * En^2 - 2.40e+000 + 7.89e+001 * En^8.95e-001]$  02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
U-235	185.72	7.29e-008 +-2.07e-008	6.17e+012	1 of 7
Pb-212	Average:	5.05e-007 +-2.80e-008	1.06e+001	3 of 5
	74.82	5.06e-007 +-1.79e-007		
	77.11	5.05e-007 +-1.23e-007		
Pb-214	238.63	5.05e-007 +-2.91e-008		
	Average:	7.35e-007 +-2.89e-008	4.47e-001	4 of 6
	77.11	6.32e-007 +-2.12e-007		
	241.98	8.35e-007 +-1.33e-007		
Tl-208	295.21	6.68e-007 +-6.06e-008		
	351.92	7.53e-007 +-3.43e-008		
	Average:	1.88e-007 +-1.66e-008	5.09e-002	2 of 5
	74.97	1.84e-007 +-5.59e-007		
Ra-226	583.14	1.88e-007 +-1.66e-008		
Ac-228	186.10	I.D.Only	1.40e+007	1 of 1
	Average:	4.40e-007 +-4.78e-008	6.13e+000	3 of 10
	338.32	3.52e-007 +-9.79e-008		
	911.07	4.89e-007 +-6.43e-008		
Ra-224	969.11	4.11e-007 +-1.04e-007		
Tl-210	240.98	1.58e-006 +-2.52e-007	8.69e+001	1 of 1
Bi-211	298.00	1.62e-007 +-1.47e-008	2.17e-002	1 of 3
Bi-214	351.07	2.17e-006 +-9.87e-008	3.55e-002	1 of 1
	Average:	6.60e-007 +-3.17e-008	3.32e-001	3 of 7
	609.31	6.29e-007 +-3.50e-008		
	1120.30	7.60e-007 +-1.17e-007		
K-40	1764.50	8.29e-007 +-9.81e-008		
	1460.80	1.03e-005 +-3.58e-007	1.12e+013	1 of 1

TOTAL: 1.68e-035 uCi/g

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UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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RSSI High Resolution Gamma Spectroscopy Analysis

## Quantum Technology GDR\_C Nuclide Activity Summary

Sample ID: 012840 STS LAKE SHORE EAST B4B 3'

Sample Size . . . . .	5.98e+002 g	Spectrum File . . . H:\PCASPEC\012840.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.0e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.0e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB  
ID. . . . . . . . . 500 ml Marinelli | ID. . . . U, Th, & Ac Natural Series + K

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
<sup>U-235</sup>	185.72	7.74e-008 +- 2.86e-008	6.17e+012	1 of 7
<sup>Pb-212</sup>	238.63	6.91e-007 +- 4.04e-008	1.06e+001	1 of 5
<sup>Pb-214</sup>	Average:	8.64e-007 +- 4.11e-008	4.47e-001	3 of 6
	241.98	1.03e-006 +- 1.75e-007		
	295.21	8.27e-007 +- 8.99e-008		
	351.92	8.62e-007 +- 4.79e-008		
<sup>Tl-208</sup>	Average:	2.22e-007 +- 2.07e-008	5.09e-002	2 of 5
	510.84	2.26e-007 +- 8.25e-008		
	583.14	2.22e-007 +- 2.14e-008		
<sup>Ra-226</sup>	186.10	I.D.Only	1.40e+007	1 of 1
<sup>Ac-228</sup>	Average:	6.84e-007 +- 6.15e-008	6.13e+000	3 of 10
	338.32	6.62e-007 +- 1.37e-007		
	911.07	7.34e-007 +- 7.97e-008		
	969.11	5.62e-007 +- 1.36e-007		
<sup>Ra-224</sup>	240.98	1.96e-006 +- 3.32e-007	8.69e+001	1 of 1
<sup>Tl-210</sup>	298.00	2.01e-007 +- 2.18e-008	2.17e-002	1 of 3
<sup>Bi-211</sup>	351.07	2.48e-006 +- 1.38e-007	3.55e-002	1 of 1
<sup>Bi-214</sup>	Average:	8.08e-007 +- 4.32e-008	3.32e-001	3 of 7
	609.31	7.92e-007 +- 4.63e-008		
	1120.30	8.75e-007 +- 1.74e-007		
	1764.50	9.56e-007 +- 1.66e-007		
<sup>K-40</sup>	1460.80	1.32e-005 +- 4.59e-007	1.12e+013	1 of 1
<b>TOTAL:</b>		<b>2.12e-005 uCi/g</b>		

## UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012841 STS LAKE SHORE EAST B4B 5'-6'

Sample Size . . . . .	6.62e+002 g	Spectrum File . . . H:\PCASPEC\012841.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-14-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <= . . . 8.000 Halflives  
Library Energy Tolerance. . . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
<sup>U-235</sup>	185.72	1.13e-007 +-2.61e-008	6.17e+012	1 of 7
<sup>Pb-212</sup>	238.63	6.89e-007 +-3.89e-008	1.06e+001	1 of 5
<sup>Pb-214</sup>	Average:	7.91e-007 +-3.85e-008	4.47e-001	3 of 6
	241.98	7.89e-007 +-1.66e-007		
	295.21	7.91e-007 +-7.26e-008		
	351.92	7.91e-007 +-4.73e-008		
<sup>Tl-208</sup>	Average:	1.93e-007 +-2.06e-008	5.09e-002	2 of 5
	510.84	2.41e-007 +-7.82e-008		
	583.14	1.90e-007 +-2.14e-008		
<sup>Ra-226</sup>	186.10	I.D.Only	1.40e+007	1 of 1
<sup>Ac-228</sup>	Average:	5.73e-007 +-5.70e-008	6.13e+000	3 of 10
	338.32	6.01e-007 +-1.23e-007		
	911.07	5.89e-007 +-7.68e-008		
	969.11	5.08e-007 +-1.18e-007		
<sup>Ra-224</sup>	240.98	9.58e-007 +-3.14e-007	8.69e+001	1 of 1
<sup>Bi-214</sup>	Average:	7.58e-007 +-4.15e-008	3.32e-001	3 of 7
	609.31	7.38e-007 +-4.54e-008		
	1120.30	9.61e-007 +-1.42e-007		
	1764.50	7.60e-007 +-1.48e-007		
<sup>K-40</sup>	1460.80	1.25e-005 +-4.53e-007	1.12e+013	1 of 1
<b>TOTAL:</b>		<b>1.66e-005 uCi/g</b>		

## UNKNOWN PEAKS

Energy	Centroid	Net	Un-	C.L.	Bkg.	FWHM	Net
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(keV)	Channel	Counts	Certainty	Counts	Counts	(keV)	Gamma/sec
====	=====	=====	=====	=====	=====	=====	=====
None							





RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012861 STS LAKE SHORE EAST B5A 1'

Sample Size . . . . .	6.60e+002 g	Spectrum File . . . H:\PCASPEC\012861.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff. = 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.01e-006 +-2.23e-007	2.74e+002	1 of 7
U-235	Average:	1.43e-007 +-2.93e-008	6.17e+012	2 of 7
	93.35	2.53e-006 +-5.61e-007		
	185.72	1.37e-007 +-2.94e-008		
Th-234	Average:	4.17e-006 +-6.54e-007	5.78e+002	2 of 3
	92.38	4.14e-006 +-9.18e-007		
	92.80	4.19e-006 +-9.31e-007		
Pb-212	Average:	1.20e-006 +-4.17e-008	1.06e+001	3 of 5
	74.82	1.20e-006 +-2.66e-007		
	77.11	1.20e-006 +-1.64e-007		
	238.63	1.20e-006 +-4.37e-008		
Pb-214	Average:	1.01e-006 +-3.91e-008	4.47e-001	5 of 6
	74.82	1.56e-006 +-4.59e-007		
	77.11	9.96e-007 +-2.82e-007		
	241.98	1.85e-006 +-1.70e-007		
	295.21	1.07e-006 +-8.34e-008		
	351.92	9.24e-007 +-4.67e-008		
Tl-208	Average:	3.58e-007 +-2.24e-008	5.09e-002	3 of 5
	74.97	3.59e-007 +-8.30e-007		
	510.84	4.19e-007 +-7.80e-008		
	583.14	3.53e-007 +-2.34e-008		
Pa-234	94.66	7.18e-007 +-1.59e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.11e-006 +-6.36e-008	6.13e+000	3 of 10
	338.32	1.09e-006 +-1.37e-007		
	911.07	1.18e-006 +-8.14e-008		
	969.11	8.93e-007 +-1.54e-007		

$\lambda$ -224	240.98	3.51e-006	--3.23e-007	8.69e+001	1 of	1
Zr-210	298.00	2.59e-007	--2.03e-008	2.17e-002	1 of	3
Bi-211	351.07	2.66e-006	--1.34e-007	3.55e-002	1 of	1
Bi-214	Average:	9.73e-007	--4.25e-008	3.32e-001	3 of	7
	609.31	9.22e-007	--4.69e-008			
	1120.30	9.84e-007	--1.59e-007			
	1764.50	1.36e-006	--1.31e-007			
K-40	1460.80	1.07e-005	--4.57e-007	1.12e+013	1 of	1
TOTAL:		2.78e-005	uCi/g			

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#### UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012863 STS LAKE SHORE EAST B8A 3'-4'

7.25-56.5 3-16

Sample Size . . . . .	6.05e+002 g	Spectrum File . . . H:\PCASPEC\012863.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [OFF]. . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.81e-006 +-3.51e-007	2.74e+002	1 of 7
U-235	Average:	3.13e-007 +-5.08e-008	6.17e+012	2 of 7
	93.35	4.54e-006 +-8.81e-007		
	185.72	2.99e-007 +-5.09e-008		
Th-234	Average:	7.48e-006 +-1.03e-006	5.78e+002	2 of 3
	92.38	7.43e-006 +-1.44e-006		
	92.80	7.53e-006 +-1.46e-006		
Pb-212	Average:	7.02e-006 +-9.16e-008	1.06e+001	5 of 5
	74.82	7.16e-006 +-5.47e-007		
	77.11	6.92e-006 +-3.15e-007		
	87.30	3.45e-006 +-5.62e-007		
	238.63	7.16e-006 +-9.95e-008		
	300.09	5.43e-006 +-7.72e-007		
Pb-214	Average:	2.09e-006 +-6.71e-008	4.47e-001	5 of 6
	74.82	2.08e-006 +-9.41e-007		
	77.11	2.09e-006 +-5.42e-007		
	241.98	2.09e-006 +-2.68e-007		
	295.21	2.09e-006 +-1.45e-007		
	351.92	2.09e-006 +-8.00e-008		
Tl-208	Average:	2.46e-006 +-4.81e-008	5.09e-002	5 of 5
	74.97	2.39e-006 +-1.70e-006		
	277.35	2.74e-006 +-3.77e-007		
	510.84	2.84e-006 +-1.51e-007		
	583.14	2.38e-006 +-5.24e-008		
	860.37	2.99e-006 +-2.43e-007		
Pa-234	Average:	8.18e-007 +-1.30e-007	6.70e+000	2 of 14
	94.66	8.18e-007 +-2.50e-007		

	131.20	8.18e-007	--1.52e-007				
Ra-226	186.10		1.D.Only	1.40e+007	1 of	1	
/Ac-228	Average:	7.28e-006	--1.16e-007	6.13e-000	10 of	10	
	209.28	6.65e-006	--6.30e-007				
	270.23	6.36e-006	--6.73e-007				
	327.64	7.37e-006	--7.21e-007				
	338.32	7.24e-006	--2.52e-007				
	409.51	6.51e-006	+1.24e-006				
	463.00	7.22e-006	--6.43e-007				
	794.70	7.62e-006	--6.61e-007				
	911.07	7.38e-006	--1.83e-007				
	964.60	7.21e-006	--6.11e-007				
	969.11	7.34e-006	--2.67e-007				
Ra-224	240.98	9.86e-006	--5.09e-007	8.69e+001	1 of	1	
Pi-212	Average:	5.17e-006	--2.98e-007	1.01e-000	2 of	2	
	327.96	5.20e-006	--1.79e-005				
	727.17	5.17e-006	--2.99e-007				
Bi-211	351.07	8.62e-007	--2.30e-007	3.55e-002	1 of	1	
Pi-214	Average:	2.35e-006	--6.91e-008	3.32e-001	4 of	7	
	609.31	2.25e-006	+7.66e-008				
	1120.30	2.47e-006	--2.26e-007				
	1238.10	3.29e-006	--5.82e-007				
	1764.50	3.05e-006	--2.46e-007				
K-40	1460.80	1.51e-005	--5.88e-007	1.12e+013	1 of	1	
TOTAL:		6.26e-005	uCi/g				

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
1586.93	6515.65	119	27	52	121	1.46	3.942e+000

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR\_C Nuclide Activity Summary

Sample ID: 012864 STS LAKE SHORE EAST B8A 6'

J-25-515 6

Sample Size . . . . .	8.80e+002 g	Spectrum File . . . H:\PCASPEC\012864.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.30e-006 +-2.23e-007	2.74e+002	1 of 7
U-235	Average:	2.20e-007 +-2.86e-008	6.17e+012	2 of 7
	93.35	3.26e-006 +-5.60e-007		
	185.72	2.12e-007 +-2.86e-008		
Th-234	Average:	5.38e-006 +-6.52e-007	5.78e+002	2 of 3
	92.38	5.34e-006 +-9.16e-007		
	92.80	5.41e-006 +-9.29e-007		
Pb-212	Average:	1.99e-006 +-4.34e-008	1.06e+001	5 of 5
	74.82	2.04e-006 +-2.58e-007		
	77.11	1.77e-006 +-1.83e-007		
	87.30	1.05e-006 +-2.93e-007		
	238.63	2.03e-006 +-4.61e-008		
	300.09	1.63e-006 +-4.34e-007		
Pb-214	Average:	1.41e-006 +-3.96e-008	4.47e-001	5 of 6
	74.82	4.46e-007 +-4.44e-007		
	77.11	1.42e-006 +-3.15e-007		
	241.98	1.42e-006 +-1.67e-007		
	295.21	1.42e-006 +-8.03e-008		
	351.92	1.42e-006 +-4.82e-008		
Tl-208	Average:	7.57e-007 +-2.34e-008	5.09e-002	3 of 5
	510.84	8.06e-007 +-8.21e-008		
	583.14	7.45e-007 +-2.50e-008		
	860.37	9.27e-007 +-1.21e-007		
Pa-234	94.66	9.27e-007 +-1.59e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	2.09e-006 +-6.20e-008	6.13e+000	7 of 10
	209.28	2.24e-006 +-3.90e-007		

	270.23	1.93e-006	--3.80e-007			
	338.32	1.95e-006	--1.35e-007			
	463.00	2.04e-006	--3.34e-007			
	794.70	2.12e-006	--3.61e-007			
	911.07	2.06e-006	--9.07e-008			
	969.11	2.28e-006	--1.37e-007			
Ra-224	240.98	1.98e-006	--3.16e-007	8.69e+001	1 of 1	
$\beta^-$ -212	727.17	1.54e-006	--1.64e-007	1.01e+000	1 of 2	
$\beta^-$ -214	Average:	1.29e-006	--4.31e-008	3.32e-001	3 of 7	
	609.31	1.26e-006	--4.66e-008			
	1120.30	1.26e-006	--1.49e-007			
	1764.50	1.60e-006	--1.70e-007			
X-40	1460.80	8.55e-006	--3.28e-007	1.12e+013	1 of 1	
TOTAL:		2.74e-005	uCi/g			

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#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012865 STS LAKE SHORE EAST B8B 1'

J-51.5 11

Sample Size . . . . . 9.04e+002 g | Spectrum File . . H:\PCASPEC\012865.SPM  
Sampling Start. . . . . 00-00-00 00:00 | Counting Start. . . . . 08-15-01 00:00  
Sampling Stop . . . . . 00-00-00 00:00 | Buildup Time. . . . . 0.00e+000 Hrs  
Current Date. . . . . 00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
$\mu$ -235	185.72	1.48e-007 +-2.28e-008	6.17e+012	1 of 7
Pb-212	Average:	5.49e-007 +-2.87e-008	1.06e+001	3 of 5
	74.82	5.49e-007 +-1.88e-007		
	77.11	5.48e-007 +-1.26e-007		
	238.63	5.49e-007 +-2.99e-008		
Pb-214	Average:	8.68e-007 +-3.00e-008	4.47e-001	5 of 6
	74.82	8.63e-007 +-3.23e-007		
	77.11	6.27e-007 +-2.17e-007		
	241.98	1.13e-006 +-1.40e-007		
	295.21	8.80e-007 +-6.25e-008		
	351.92	8.54e-007 +-3.59e-008		
Tl-208	Average:	1.41e-007 +-1.68e-008	5.09e-002	2 of 5
	74.97	1.36e-007 +-5.85e-007		
	583.14	1.41e-007 +-1.68e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.00e-007 +-4.46e-008	6.13e+000	3 of 10
	338.32	5.67e-007 +-9.96e-008		
	911.07	4.81e-007 +-5.78e-008		
	969.11	4.91e-007 +-9.90e-008		
Ra-224	240.98	2.14e-006 +-2.65e-007	8.69e+001	1 of 1
Tl-210	298.00	2.14e-007 +-1.52e-008	2.17e-002	1 of 3
Bi-211	351.07	2.45e-006 +-1.03e-007	3.55e-002	1 of 1
Bi-214	Average:	8.33e-007 +-3.38e-008	3.32e-001	3 of 7
	609.31	8.17e-007 +-3.68e-008		
	1120.30	8.14e-007 +-1.25e-007		
	1764.50	1.00e-006 +-1.16e-007		
K-40	1460.80	1.75e-005 +-4.40e-007	1.12e+013	1 of 1

TOTAL:

2.54e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR\_C Nuclide Activity Summary

Sample ID: 012866 STS LAKE SHORE EAST B8B 6'

J-51.5 6

Sample Size . . . . .	8.28e+002 g	Spectrum File . . H:\PCASPEC\012866.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^-2.40e+000 + 7.89e+001\* En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
U-235	185.72	1.27e-007 +-2.59e-008	6.17e+012	1 of 7
Pb-212	Average:	8.13e-007 +-3.42e-008	1.06e+001	3 of 5
	74.82	8.13e-007 +-2.43e-007		
	77.11	8.12e-007 +-1.42e-007		
	238.63	8.13e-007 +-3.56e-008		
Pb-214	Average:	1.04e-006 +-3.48e-008	4.47e-001	5 of 6
	74.82	1.30e-006 +-4.18e-007		
	77.11	9.17e-007 +-2.44e-007		
	241.98	1.60e-006 +-1.51e-007		
	295.21	1.03e-006 +-6.97e-008		
	351.92	1.01e-006 +-4.26e-008		
Tl-208	Average:	2.63e-007 +-1.79e-008	5.09e-002	3 of 5
	74.97	2.62e-007 +-7.56e-007		
	510.84	2.02e-007 +-6.96e-008		
	583.14	2.67e-007 +-1.86e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.90e-007 +-4.98e-008	6.13e+000	3 of 10
	338.32	1.04e-006 +-1.07e-007		
	911.07	8.77e-007 +-6.29e-008		
	969.11	7.24e-007 +-1.27e-007		
Ra-224	240.98	3.04e-006 +-2.86e-007	8.69e+001	1 of 1
Tl-210	298.00	2.50e-007 +-1.69e-008	2.17e-002	1 of 3
Bi-211	351.07	2.89e-006 +-1.22e-007	3.55e-002	1 of 1
Bi-214	Average:	1.00e-006 +-3.78e-008	3.32e-001	3 of 7
	609.31	9.60e-007 +-4.16e-008		
	1120.30	9.98e-007 +-1.48e-007		
	1764.50	1.33e-006 +-1.14e-007		

K-40 1460.80 1.01e-005 +-3.61e-007 1.12e+013 1 of 1

TOTAL: 2.04e-005 uCi/g

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UNKNOWN PEAKS

Energy keV.	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012867 STS LAKE SHORE EAST B8 3.5'-4'

H.S-51.5 35-4'

Sample Size . . . . .	7.06e+002 g	Spectrum File . . . H:\PCASPEC\012867.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff. = 1/[ 7.31e-002\*En^(-2.40e+000) + 7.89e+001\*En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
$\alpha$ -235	185.72	1.09e-007 +-2.49e-008	6.17e+012	1 of 7
$\alpha$ b-212	238.63	5.33e-007 +-3.83e-008	1.06e+001	1 of 5
$\alpha$ b-214	Average:	7.61e-007 +-3.62e-008	4.47e-001	2 of 6
	295.21	7.51e-007 +-7.12e-008		
	351.92	7.65e-007 +-4.21e-008		
$\alpha$ Tl-208	583.14	2.29e-007 +-1.82e-008	5.09e-002	1 of 5
$\alpha$ Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
$\alpha$ Ac-228	Average:	5.59e-007 +-5.23e-008	6.13e+000	3 of 10
	338.32	5.35e-007 +-1.15e-007		
	911.07	5.41e-007 +-7.29e-008		
	969.11	6.09e-007 +-9.95e-008		
$\alpha$ Ra-224	240.98	6.03e-006 +-4.33e-007	8.69e+001	1 of 1
$\alpha$ Tl-210	298.00	1.83e-007 +-1.73e-008	2.17e-002	1 of 3
$\alpha$ Bi-211	351.07	2.20e-006 +-1.21e-007	3.55e-002	1 of 1
$\alpha$ Bi-214	Average:	7.52e-007 +-3.79e-008	3.32e-001	3 of 7
	609.31	7.32e-007 +-4.13e-008		
	1120.30	7.05e-007 +-1.43e-007		
	1764.50	9.85e-007 +-1.29e-007		
K-40	1460.80	1.12e-005 +-4.22e-007	1.12e+013	1 of 1
TOTAL:		2.26e-005 uCi/g		

## UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
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None

## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR C Nuclide Activity Summary

Sample ID: 012868 STS LAKE SHORE EAST B8 6'

μ.5-51.5

Sample Size . . . . .	2.97e+002 g	Spectrum File . . . H:\PCASPEC\012868.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs

Eff.= 1/[ 7.31e-002\* En^(-2.40e+000) + 7.89e+001\* En^(8.95e-001)] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	3.46e-006 +-5.79e-007	2.74e+002	1 of 7
Th-234	Average:	1.43e-005 +-1.69e-006	5.78e+002	2 of 3
	92.38	1.42e-005 +-2.38e-006		
	92.80	1.44e-005 +-2.41e-006		
Pb-212	Average:	1.00e-005 +-1.50e-007	1.06e+001	5 of 5
	74.82	1.02e-005 +-8.06e-007		
	77.11	9.81e-006 +-5.04e-007		
	87.30	3.34e-006 +-1.01e-006		
	238.63	1.02e-005 +-1.64e-007		
	300.09	7.73e-006 +-1.29e-006		
Pb-214	Average:	2.20e-006 +-1.11e-007	4.47e-001	3 of 6
	241.98	8.00e-006 +-4.22e-007		
	295.21	1.64e-006 +-2.48e-007		
	351.92	1.80e-006 +-1.30e-007		
Tl-208	Average:	3.27e-006 +-8.00e-008	5.09e-002	5 of 5
	74.97	5.39e-007 +-2.51e-006		
	277.35	3.78e-006 +-8.55e-007		
	510.84	3.04e-006 +-2.58e-007		
	583.14	3.25e-006 +-8.65e-008		
	860.37	4.29e-006 +-4.07e-007		
Pa-234	94.66	2.47e-006 +-4.13e-007	6.70e+000	1 of 14
Ac-228	Average:	9.71e-006 +-1.93e-007	6.13e+000	10 of 10
	209.28	8.70e-006 +-1.15e-006		
	270.23	9.34e-006 +-1.30e-006		
	327.64	7.74e-006 +-1.25e-006		
	338.32	1.02e-005 +-4.25e-007		
	409.51	7.88e-006 +-1.86e-006		

	463.00	7.50e-006	--1.00e-006				
	794.70	9.64e-006	--1.10e-006				
	911.07	9.64e-006	--3.06e-007				
	964.60	9.76e-006	--1.07e-006				
	969.11	1.03e-005	--4.27e-007				
Ra-224	240.98	1.52e-006	--8.00e-007	8.69e+001	1 of 1		
Tl-210	298.00	3.99e-007	--6.02e-008	2.17e-002	1 of 3		
Bi-212	727.17	6.91e-006	--4.93e-007	1.01e+000	1 of 2		
Bi-211	351.07	5.19e-006	--3.74e-007	3.55e-002	1 of 1		
Bi-214	Average:	1.67e-006	--1.07e-007	3.32e-001	3 of 7		
	609.31	1.61e-006	--1.17e-007				
	1120.30	1.81e-006	--3.57e-007				
	1764.50	2.18e-006	--3.82e-007				
K-40	1460.80	1.43e-005	--8.65e-007	1.12e+013	1 of 1		
TOTAL:		8.91e-005	uCi/g				

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
687.18	6816.71	124	21	38	61	2.21	4.108e-003

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology  
GDR\_C Nuclide Activity Summary

Sample ID: 012869 STS LAKE SHORE EAST B9 1'

F-50.5

Sample Size . . . . .	5.29e+002 g	Spectrum File . . . H:\PCASPEC\012869.SPM
Sampling Start. . . . .	.00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	.00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	.00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff. =  $1/[7.31e-002 * En^{-2} \cdot 40e+000 + 7.89e+001 * En^{8.95e-001}]$  02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . 8.000 Halflives  
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
U-235	185.72	1.89e-007 +-3.75e-008	6.17e+012	1 of 7
Pb-212	Average:	1.56e-006 +-5.52e-008	1.06e+001	3 of 5
	74.82	1.56e-006 +-2.77e-007		
	77.11	1.56e-006 +-2.19e-007		
	238.63	1.56e-006 +-5.83e-008		
Pb-214	Average:	1.41e-006 +-5.04e-008	4.47e-001	4 of 6
	77.11	1.64e-006 +-3.76e-007		
	241.98	2.04e-006 +-2.01e-007		
	295.21	1.50e-006 +-9.84e-008		
	351.92	1.31e-006 +-6.22e-008		
Tl-208	Average:	4.84e-007 +-2.74e-008	5.09e-002	3 of 5
	74.97	4.93e-007 +-8.62e-007		
	510.84	4.77e-007 +-1.00e-007		
	583.14	4.84e-007 +-2.85e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.54e-006 +-8.06e-008	6.13e+000	3 of 10
	338.32	1.53e-006 +-1.70e-007		
	911.07	1.46e-006 +-1.11e-007		
	969.11	1.72e-006 +-1.63e-007		
Ra-224	240.98	3.86e-006 +-3.82e-007	8.69e+001	1 of 1
Tl-210	298.00	3.64e-007 +-2.39e-008	2.17e-002	1 of 3
Bi-212	727.17	9.28e-007 +-1.95e-007	1.01e+000	1 of 2
Bi-211	351.07	3.76e-006 +-1.79e-007	3.55e-002	1 of 1
Bi-214	Average:	1.32e-006 +-5.60e-008	3.32e-001	3 of 7
	609.31	1.32e-006 +-6.17e-008		
	1120.30	1.18e-006 +-2.04e-007		
	1764.50	1.44e-006 +-1.76e-007		

X-40 1460.80 9.45e-006 --4.51e-007 1.12e+013 1 of 1

TOTAL: 2.49e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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## RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology

## GDR C Nuclide Activity Summary

Sample ID: 012870 STS LAKE SHORE EAST B9 7'

F 57.5 7

Sample Size . . . . .	8.93e+002 g	Spectrum File . . H:\PCASPEC\012870.SPM
Sampling Start. . . . .	00-00-00 00:00	Counting Start. . . . . 08-15-01 00:00
Sampling Stop . . . . .	00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. . . . .	00-00-00 00:00	Decay Time [ OFF] . . . . . 0.00e+000 Hrs

Eff. =  $1/[7.31e-002 * En^{-2.40e+000} + 7.89e+001 * En^{8.95e-001}]$  02-01-01 12:00

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## FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g )	Halflife (hrs)	Peaks Found
Ra-223	94.90	8.48e-007 +-1.74e-007	2.74e+002	1 of 7
U-235	Average:	1.62e-007 +-2.66e-008	6.17e+012	2 of 7
	93.35	2.13e-006 +-4.37e-007		
	185.72	1.55e-007 +-2.67e-008		
Th-234	Average:	3.51e-006 +-5.09e-007	5.78e+002	2 of 3
	92.38	3.48e-006 +-7.16e-007		
	92.80	3.53e-006 +-7.25e-007		
Pb-212	Average:	9.06e-007 +-3.18e-008	1.06e+001	3 of 5
	74.82	9.06e-007 +-1.94e-007		
	77.11	9.06e-007 +-1.44e-007		
	238.63	9.06e-007 +-3.31e-008		
Pb-214	Average:	1.24e-006 +-3.45e-008	4.47e-001	4 of 6
	77.11	1.53e-006 +-2.48e-007		
	241.98	1.56e-006 +-1.74e-007		
	295.21	1.22e-006 +-6.90e-008		
	351.92	1.22e-006 +-4.15e-008		
Tl-208	Average:	3.04e-007 +-1.75e-008	5.09e-002	3 of 5
	74.97	2.95e-007 +-6.05e-007		
	510.84	3.66e-007 +-6.30e-008		
	583.14	2.99e-007 +-1.82e-008		
Pa-234	94.66	6.05e-007 +-1.24e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.63e-007 +-5.26e-008	6.13e+000	3 of 10
	338.32	1.09e-006 +-1.13e-007		
	911.07	9.53e-007 +-7.00e-008		
	969.11	8.66e-007 +-1.12e-007		
Ra-224	240.96	2.96e-006 +-3.30e-007	8.69e+001	1 of 1

TI-210	298.00	2.97e-007	--1.68e-008	2.17e-002	1 of	3
Bi-211	351.07	3.51e-006	--1.19e-007	3.55e-002	1 of	1
B-214	Average:	1.16e-006	--3.97e-008	3.32e-001	3 of	7
	609.31	1.10e-006	--4.44e-008			
	1120.30	1.20e-006	--1.37e-007			
	1764.50	1.50e-006	--1.17e-007			
K-40	1460.80	8.56e-006	--3.40e-007	1.12e+013	1 of	1
TOTAL:		2.50e-005	uCi/g			

#### UNKNOWN PEAKS

Energy keV	Centroid Channel	Net Counts	Un- certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							



October 2, 2001

Illinois Center Plaza Venture  
An Illinois Limited Partnership  
c/o Mr. Melvin Lippe  
Altheimer & Gray  
10 South Wacker Drive  
Chicago, Illinois 60606-7482

Mr. James Loewenberg  
Loewenberg and Associates  
1 West Superior Street  
Chicago, Illinois 60610

**RE: Addendum to Report: Results of Expanded Gamma Radiation Survey, 26-Acre Site,  
221 North Columbus Drive, Chicago, Illinois—STS Project No. 1-32193-XH**

Dear Messrs. Lippe and Loewenberg:

As you know, the U.S. Environmental Protection Agency (USEPA) performed radiation screening at the Family Golf Center property located 221 North Columbus Drive (the Site). The Site is developed with a golf course on a 26-acre parcel located to the southwest of the intersection of Lake Shore Drive and (lower) Wacker Drive in Chicago, Illinois. The USEPA measured anomalous gamma radiation levels in portions of the Site and requested that a more extensive radiation survey be conducted.

#### **RADIATION SURVEY**

Illinois Center Plaza Venture, an Illinois Limited Partnership (as the current owner and seller of the Site) and Loewenberg and Associates (as a potential purchaser of the Site) retained STS Consultants, Ltd. (STS) to perform a radiation survey at the Site. The purpose of the survey was to further explore areas exhibiting elevated gamma radiation and to sample and document the extent of radioactive materials those areas. The result of this work was described in STS's report dated September 19, 2001.

Following issuance of the September 19, 2001 report, it was determined that several areas near the perimeter of the Site were not included in the radiation survey. The areas not included in the initial survey were primarily covered with pavement (asphalt traffic drives/parking areas, concrete and brick walkways and patios, etc.). It should be noted that the presence of pavement limits the effectiveness of the survey in that the gamma radiation is attenuated or shielded by overlying pavement As a result, the ability to detect anomalous gamma readings is somewhat diminished. Radiation screening conducted by the USEPA and (initially) by STS did not include paved areas or areas beneath floor slabs in

buildings. STS subsequently re-mobilized to the Site to survey radiation in paved areas not included in previous rounds of screening.

We understand that portions of the Site will be developed separately, and as such, these areas warrant surface radiation screening. To that end, areas not included in previous radiation surveys were screened, regardless of whether the area was paved or not. While the pavement diminishes the certainty of detecting elevated gamma readings, it may be possible to identify anomalies where gamma readings are sufficiently above the surrounding (background) readings. To this end, additional gamma radiation screening was conducted as described below.

### **EXPANDED RADIATION SURVEY**

#### **Field Methods**

As with the previous survey work, STS laid out a 5 x 5-meter grid in areas not included in the initial survey. The grid coordinates used in the previous survey were correlated to the grid coordinates used to survey the remaining areas at the Site. A figure showing the limits of the expanded survey is attached.

The survey was conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI probe. The probe was unshielded to provide for maximum sensitivity in the reconnaissance mode. The probe was held approximately 1 to 2 inches above the ground and the entire interior of each cell was walked. The highest reading at each grid cell was recorded in a field log.

#### **Field Screening**

Approximately 760 additional 5 x 5-meter grids were added to the radiation survey area, as described below:

**Sampling Along the Western Perimeter.** The largest area in the expanded radiation survey was the parking lot located at the western end of the Site along Columbus Drive where an additional 276 (complete or partial) grid cells were added to the surveyed area.

**Sampling on North Field Drive and North Harbor Drive.** Areas located on North Field Drive and on North Harbor Drive (near the southern perimeter of the Site) where an additional 102 grid cells and 108 grid cells, respectively, were surveyed.

**Sampling Along Other Portions of the Perimeter.** Around the remainder of the perimeter of the Site, 90 (whole or partial) cells were surveyed near the northwest corner of the Site where data had not previously been collected. An additional 26 cells were surveyed near the southwest corner; and approximately 156 (whole or partial) cells were surveyed near the southeast and east perimeter of the Site.

## **RESULTS OF EXPANDED FIELD SCREENING**

Due to the presence of pavement over the majority of the newly surveyed areas, it is difficult to correlate the measurements to those taken in unpaved (unshielded) areas at the Site. The shielding by the pavement would suggest the counts per minute (CPM) value would be somewhat less than the CPM in the unpaved portions of the Site.

### **Comparative Evaluation**

Measurements taken in unpaved areas at the Site were on the order of 6,000 to 9,000 CPM, with a cleanup standard of 20,000 CPM based on a calibrated standard. Conversely, measurements taken in paved areas at the Site were on the order of 4,000 to 7,000 CPM (about 30 percent less than in unpaved areas) suggesting cleanup standard of 13,000 to 15,000 CPM. However, this correlation is subject to considerable uncertainty and should only be used as a general qualitative indicator of the presence or absence of gamma contamination.

In evaluating the data, STS considered CPM trends observed in the paved areas, to assess the presence of anomalies (elevated gamma counts) beneath the pavement.

**Readings Along the Western Perimeter.** In the western parking lot, the background readings for the paved areas were typically in the 5,000 to 6,000 CPM range. The lowest values were in the low 4,000 CPM along the south side of the Commonwealth Edison substation. The highest values in this parking lot area were in the 9,000 to 10,000 CPM range at the northeast corner of the substation, at the northwest corner of the lot near the elevator, and at the northeast corner of the lot near the Golf Center building. These associations with buildings suggest the elevated readings may be the result of brick (a source of gamma radiation) or other construction materials influencing the readings. Similarly, the lowest readings could be from a thicker pavement or footing section, particularly where those low readings are immediately adjacent to the building wall.

**Readings on North Harbor Drive.** Measurements taken on Harbor Drive are generally in the 4,000 to 6,000 CPM range. The highest measurement in the paved section was 7,500 CPM. North Harbor Drive may have a thicker pavement section, in that the readings are lower, more in line with the parking lot to the west.

**Readings on North Field Drive.** The readings on North Field Drive range from approximately 6,000 to 8,000 CPM, with low readings in the upper 5,000 CPM range and a high reading of 11,000 CPM. Again, none of these readings appear sufficiently high to be indicative of a localized area of gamma contamination.

**Readings Along Other Portions of the Perimeter.** The remainder of the perimeter areas consists of a mixture of paved paths, brick-paved patios and unpaved areas. Those areas exhibit a range of gamma readings somewhat lower than the remainder of the Site but still within the anticipated range. Values range from 4,000 CPM lows to upper 9,000 CPM highs, but are typically in the 5,000 to 7,000 CPM range. None of these areas exhibit evidence of elevated radioactivity indicative of contamination.

### **DATA INTERPRETATION AND CONCLUSIONS**

Based upon the results of the expanded survey no additional areas of elevated gamma radiation indicative of contamination (twice background levels) have been identified at the Site. The areas found to be contaminated in the previous surveys (in unpaved areas) exhibited gamma readings in the 20,000 to 300,000 CPM range and higher. The expanded gamma radiation survey described herein did not identify areas with anomalous gamma readings (additional sources of radiation).

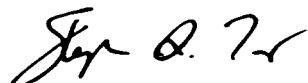
Considering the presence of pavement cover and the potential shielding affects, STS recommends that if future development or renovation activities remove existing pavements, gamma radiation screening should be conducted in paved areas exhibiting the highest gamma measurements.

These interpretations are based on our survey data and experience on similar sites in the immediate vicinity. No guarantee regarding the presence or absence of radiologically impacted soil or fill is intended, either expressed or implied, in the conclusions and findings in this letter report.

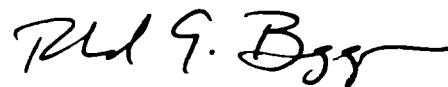
If you have any questions regarding the findings of this additional investigation or any other aspect of this project, please call with the undersigned at (847) 279-2500.

Regards,

STS CONSULTANTS, LTD.



Stephen G. Torres, C.P.G.  
Science Group Manager



Richard G. Berggreen, C.P.G.  
Principal Geologist

Attachment